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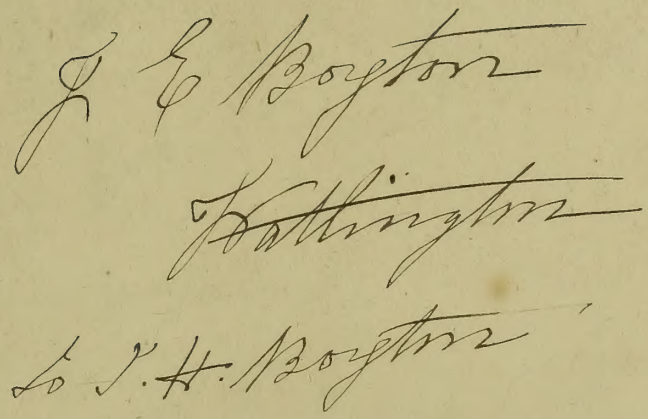

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THE

NATURAL HISTORY

AND

Diseases

OF THE

HUMAN TEETH.

IN TWO PARTS.

Illustrated with Twenty-three Engravings.

THIRD EDITION.

BY JOSEPH FOX,

MEMBER OF THE ROYAL COLLEGE OF SURGEONS, LONDON; AND OF THE SOCIETY OF MEDICINE, PARIS:
LECTURER ON THE STRUCTURE AND DISEASES OF THE TEETH, AT GUY'S HOSPITAL;
AND SURGEON DENTIST EXTRAORDINARY TO THEIR ROYAL HIGHNESSES
THE DUKES OF KENT AND SUSSEX.

LONDON:

PRINTED FOR E. COX, ST. THOMAS'S STREET, SOUTHWARK.

1833.

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PART I.

CONTAINING

THE HISTORY

OF THE

FORMATION AND STRUCTURE

OF

THE TEETH;

THE SYMPTOMATIC DISEASES

INCIDENTAL TO THE

FIRST DENTITION;

THE CHANGES WHICH TAKE PLACE DURING THE

SECOND DENTITION;

AND THE TREATMENT TO PREVENT AND REMEDY IRREGULARITIES IN THE ARRANGEMENT OF THE TEETH.

DEDICATION TO THE FIRST EDITION.

TO

HENRY CLINE, ESQ.

LECTURER ON ANATOMY, AND SURGEON OF ST. THOMAS'S HOSPITAL.

DEAR SIR,

THE numerous and continued marks of friendship and attention which I have received from you, demand my most grateful acknowledgements.

When at a very early age I was deprived of my father, you kindly stepped forward with your advice, and, by your countenance, and the sanction of your name, transferred to me the confidence of his friends, and secured the continuance of a respectable practice.

To the knowledge I obtained from you when your pupil, and the opportunities of information I have since derived from the easy access with which you have always favoured me,

I attribute, in a very considerable degree, the success which has attended my practice in that particular branch of the profession to which I have applied.

Your having been pleased to speak favourably respecting the utility of the present Work, is a great encouragement to me in submitting it to the Public; and, in permitting me to inscribe it to you, I feel another flattering mark of attention conferred on,

Dear Sir,

Your faithful and obedient Servant,

JOSEPH FOX.

No. 54, Lombard-street,
April 20, 1803.

PREFACE TO THE THIRD EDITION.

Since the appearance of the Second Edition of this work, the profession have lost the personal services of its respected Author; but, notwithstanding twenty years have elapsed since he gave his last attention to the subject, it is the opinion of good authorities that neither alterations nor additions are required.

The importance of duly attending to the diseases of the teeth, and the motives which induced the Author to publish, cannot be better explained than by making the following reprint of his own preface.

"The operations of the living functions of all animal bodies having a constant tendency to consume the substance of which the general frame consists, a certain and regular provision is required for the repairs of those injuries which the body commits upon itself.

"Abundant supplies for the production of new corporeal matter exist, as articles of food, in the animal and vegetable

kin doms; and, by a bountiful Providence, are adapted to the taste and instincts of all his creatures. But before these articles of food can become nutriment for the body, they must undergo certain processes. The first is, that whereby it is broken down into small particles, and, being mingled with the fluids of the mouth, is comminuted into a fine mass, and prepared for the action of the stomach, in the process of digestion.

"The teeth are the organs provided by nature for the mastication of food, which is an operation so essential to health, that without a due preparation of the aliments, the digestion must always be more or less deranged.

"The teeth which appear in the early part of life are adapted to the state of childhood; and at a certain period are succeeded by a second set, which are designed to continue during the remainder of life.

"The first, or temporary set of teeth, are very liable to become diseased; and in the majority of cases they do not naturally fall out in sufficient time to permit the second, or permanent, set of teeth to arrange themselves in their proper order.

" A knowledge of the changes which the teeth undergo, is a very interesting part of natural history, and is absolutely requisite to enable a practitioner in surgery to render such assistance during the progress of the second dentition, as may preserve the permanent teeth from being injured by the diseases of the temporary teeth; or, from acquiring that irregularity which always occasions so much deformity, and often destroys correct pronunciation.

" An attention to the appearance of the teeth;—a desire to preserve them in a healthy state;—and the necessity which exists of procuring relief when affected by disease, are sources of considerable occupation. In the metropolis and large towns, professional men, as dentists, are enabled to confine their practice to this department alone; but in those situations where surgeons are obliged to undertake medicine and surgery in all their branches, it is very necessary that they should be as well acquainted with the structure and diseases of the teeth, as of any other part of practice whatsoever.

" Mr. Hunter's publication on the teeth was the first scientific book ever published upon this subject; and, as an anatomical work, must ever enjoy great celebrity; but not having practically devoted much of his attention to the operations upon the

teeth, there can be no reflection upon Mr. Hunter's merit in stating, that in many essential points he was wholly, but unavoidably, deficient; particularly in regard to the right management of the teeth during the second dentition."

Further it appears that during the time the Author was engaged as a dresser with Mr. Cline, he found amongst the pupils of St. Thomas's and Guy's Hospitals a great desire to obtain particular information concerning the diseases of the teeth. Frequent conversation on these subjects, and descriptions of the modes of performing some operations, led to the delivery of a Course of Lectures on the Structure and Diseases of the Teeth. In this undertaking, much assistance was rendered by Mr. (now Sir Astley) Cooper. The first Course was given in the Spring of 1799, after which they were continued as one of the Spring Courses of Lectures delivered at Guy's Hospital, and finally gave origin to the present work.

London, October 15th, 1833.

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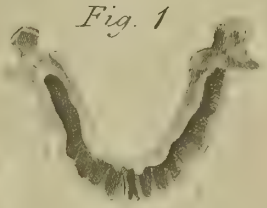
Plate 1.

Fig. 1



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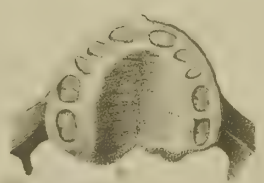

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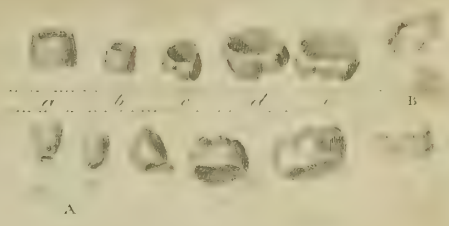
Fig. 1



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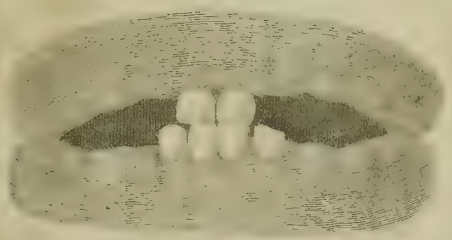

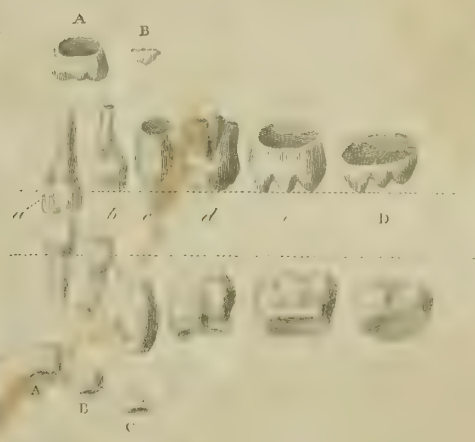

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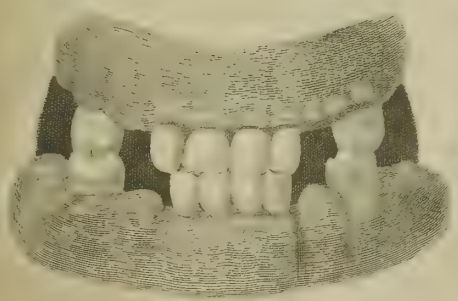

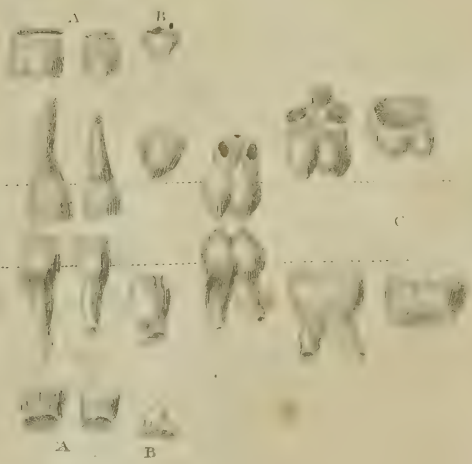

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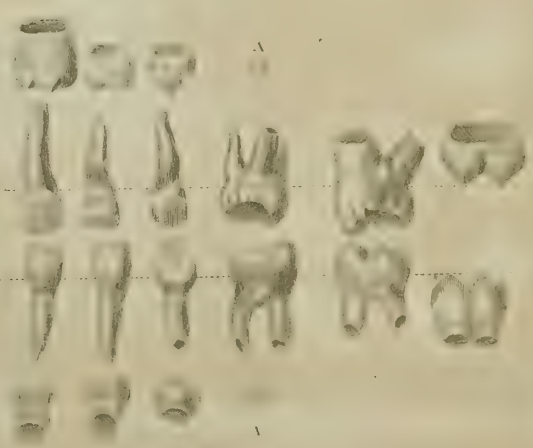

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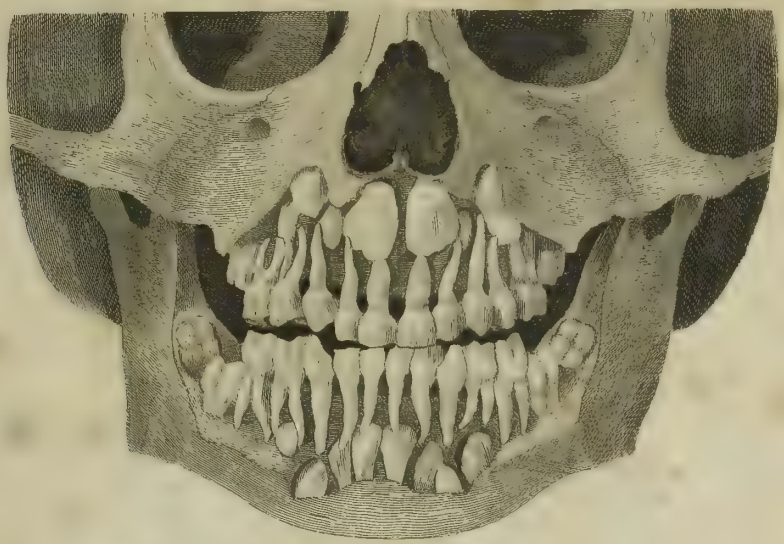

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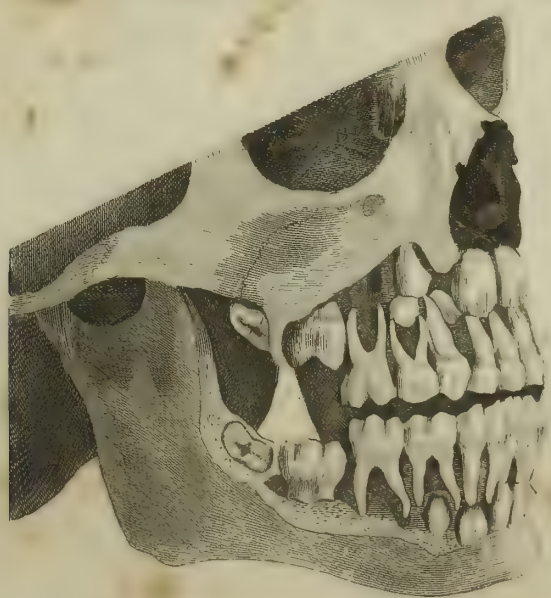

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Fig. 4

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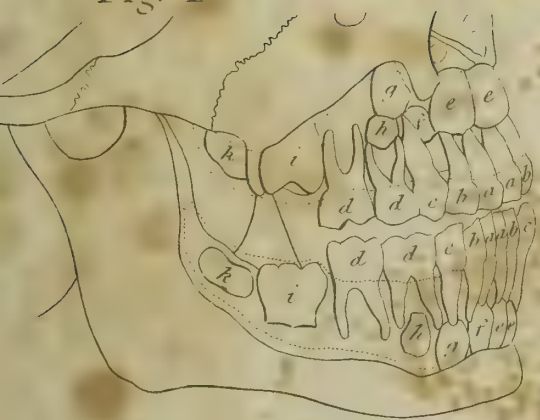

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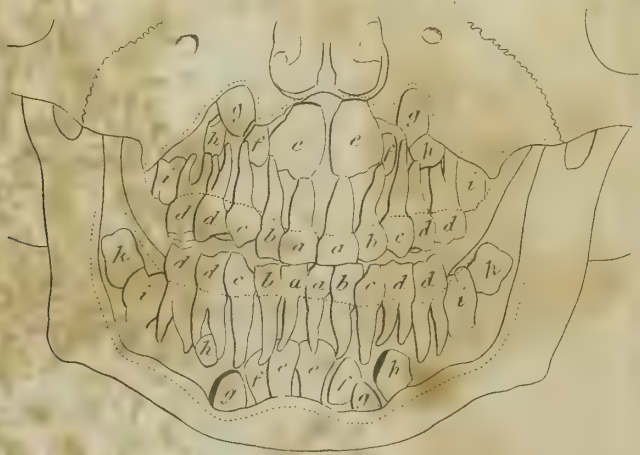

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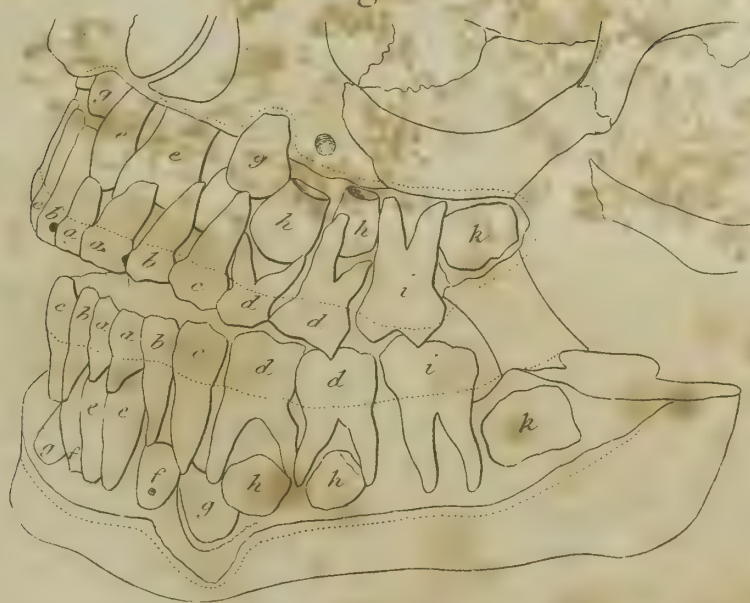

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Row 1

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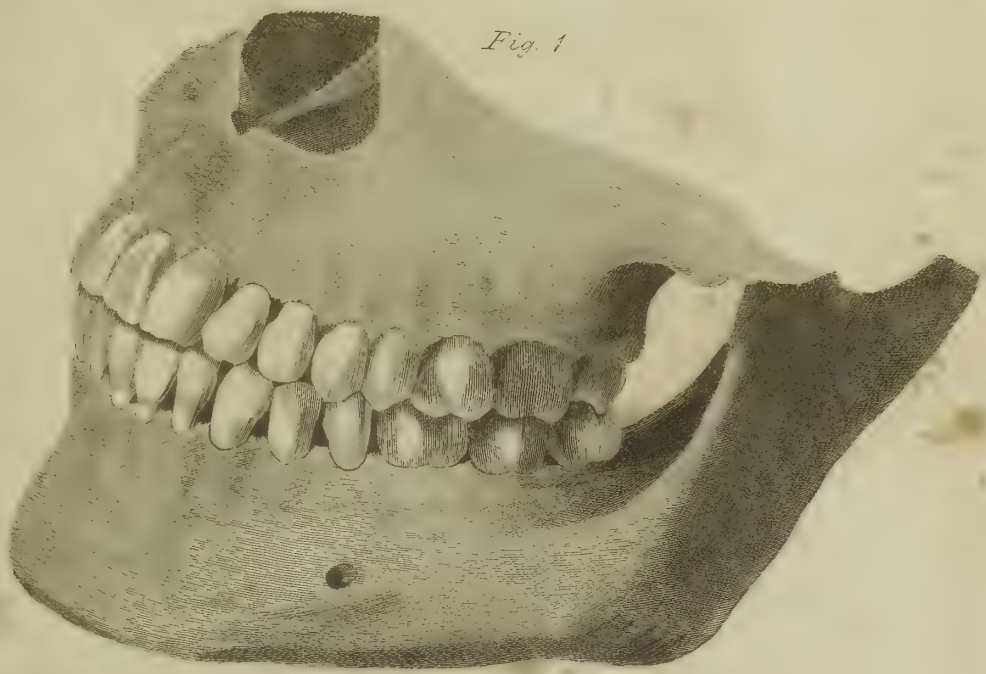
Fig. 1



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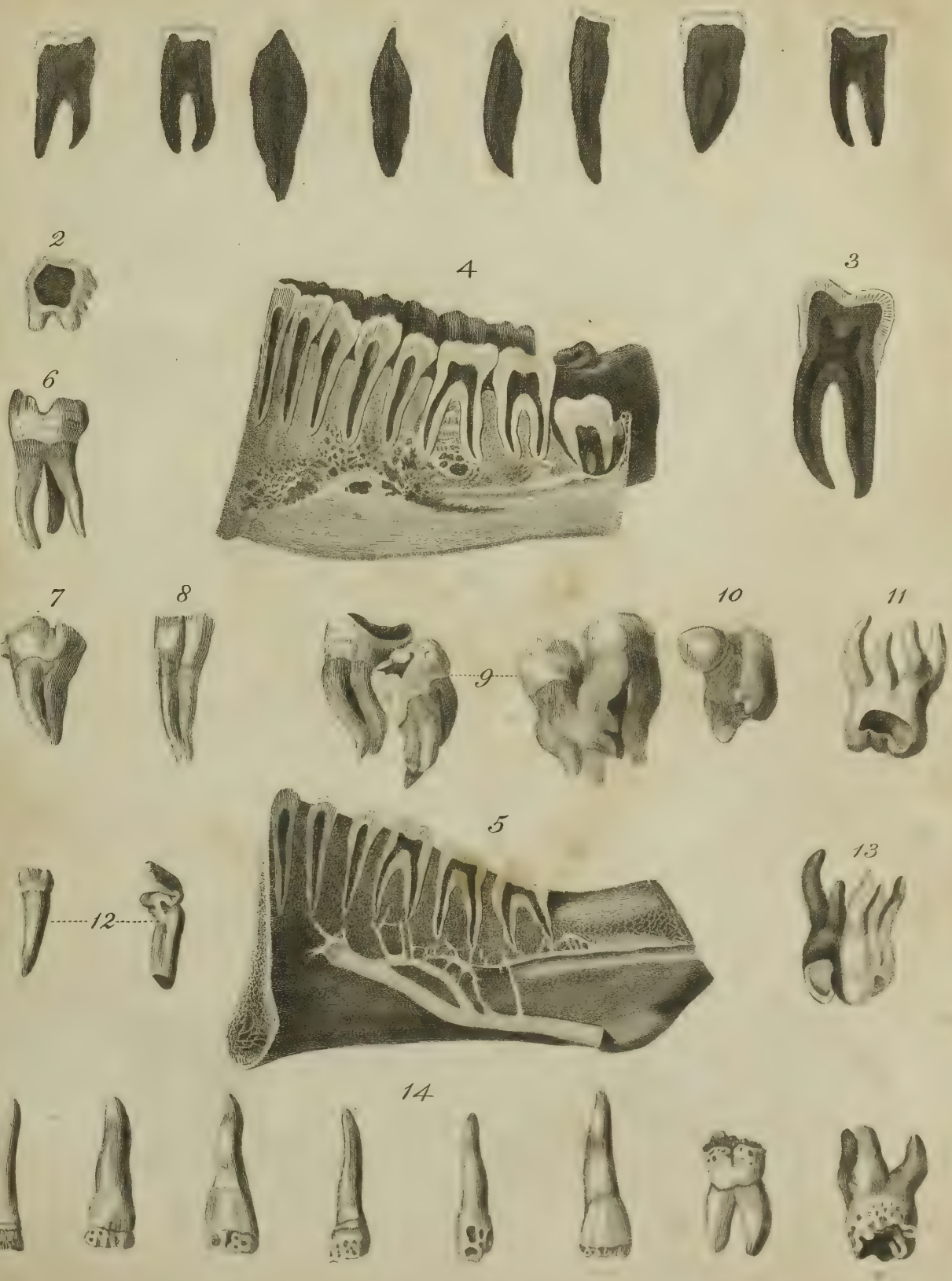

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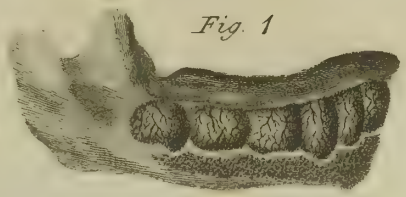

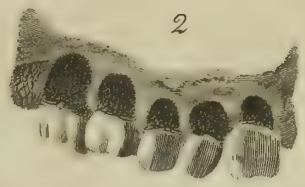

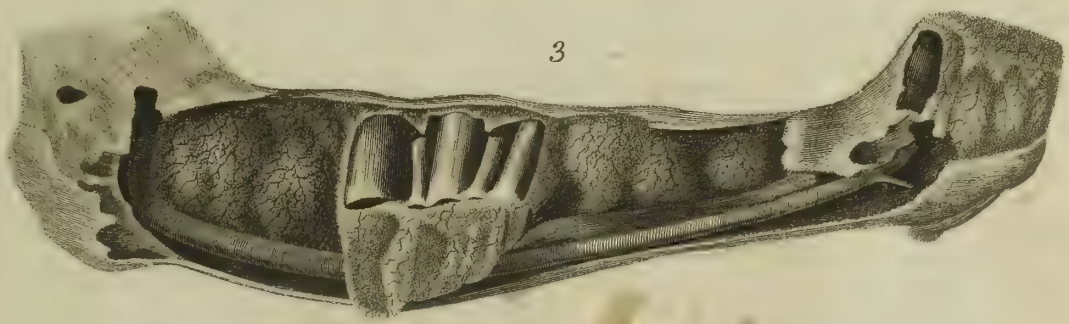

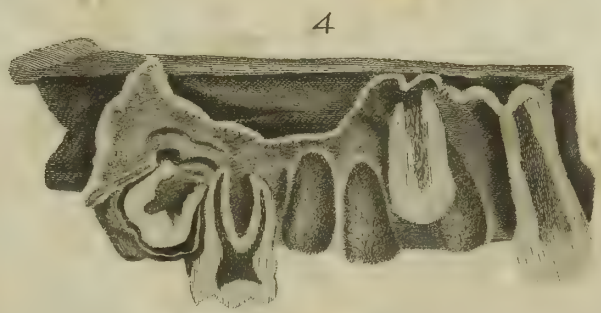

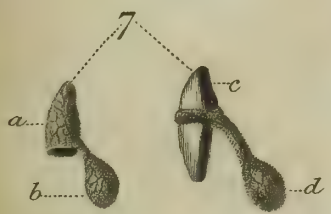

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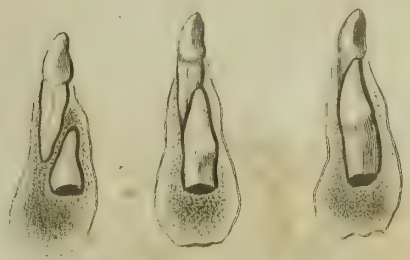

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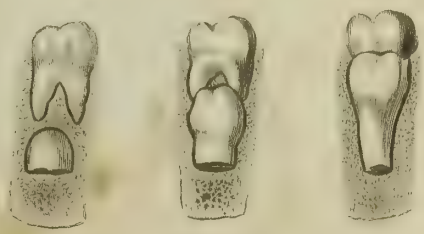

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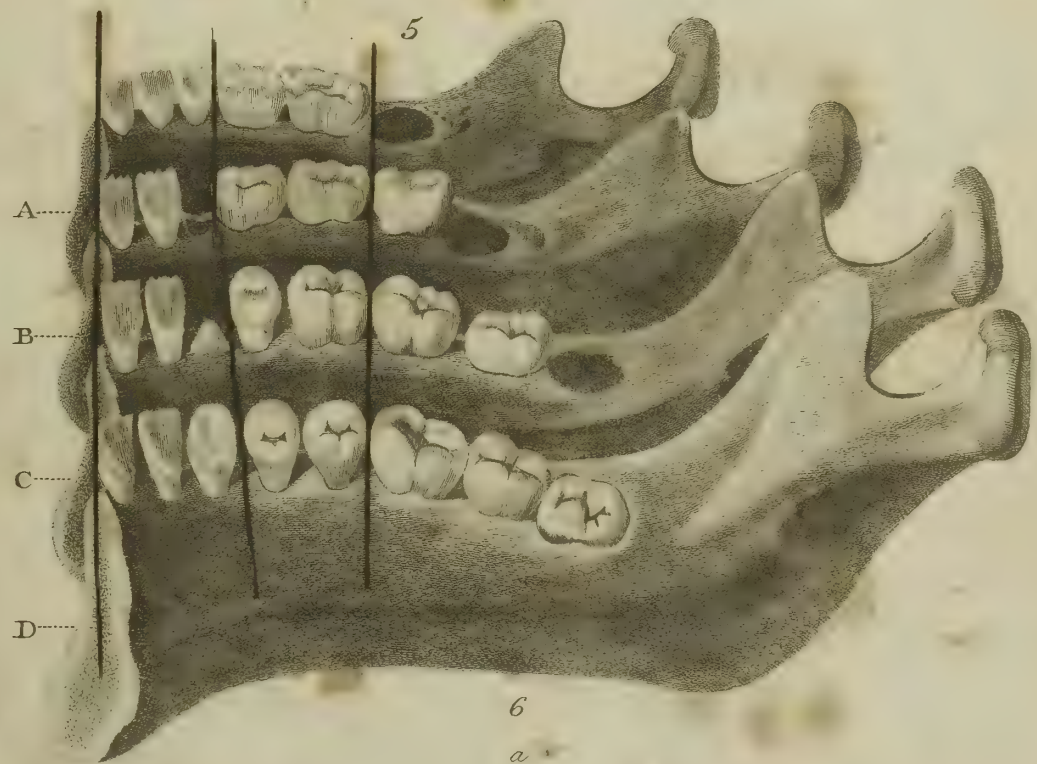

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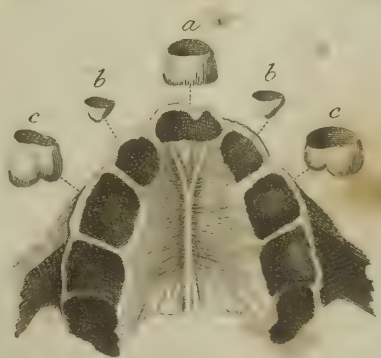

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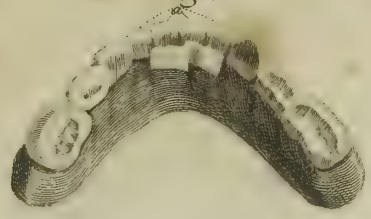

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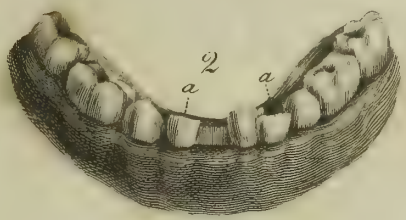

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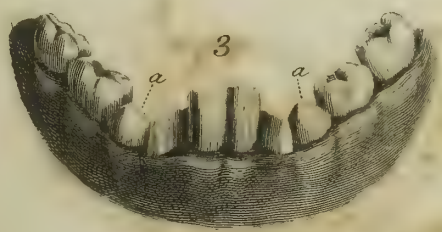

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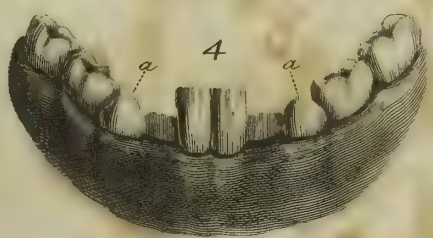

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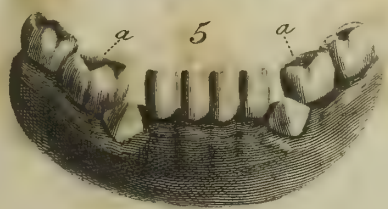

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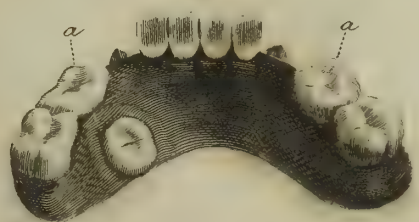

Fig. 7

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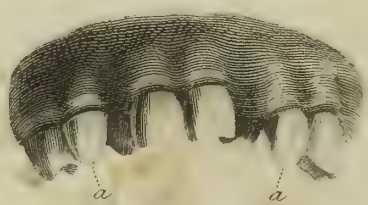

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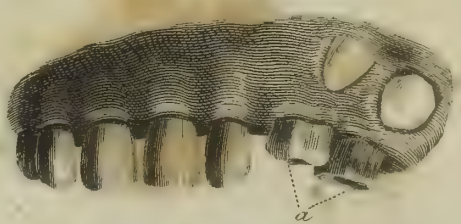

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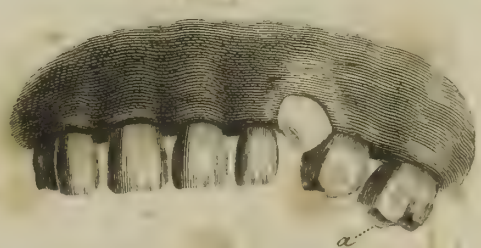

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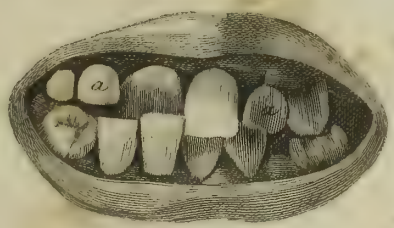

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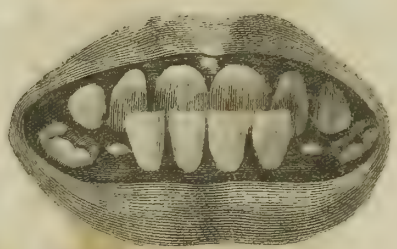

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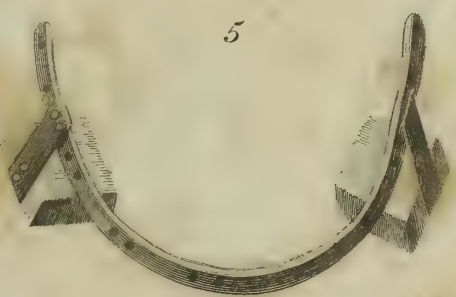

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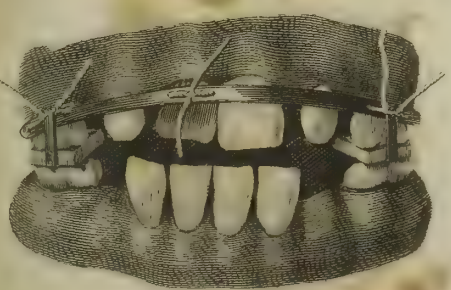

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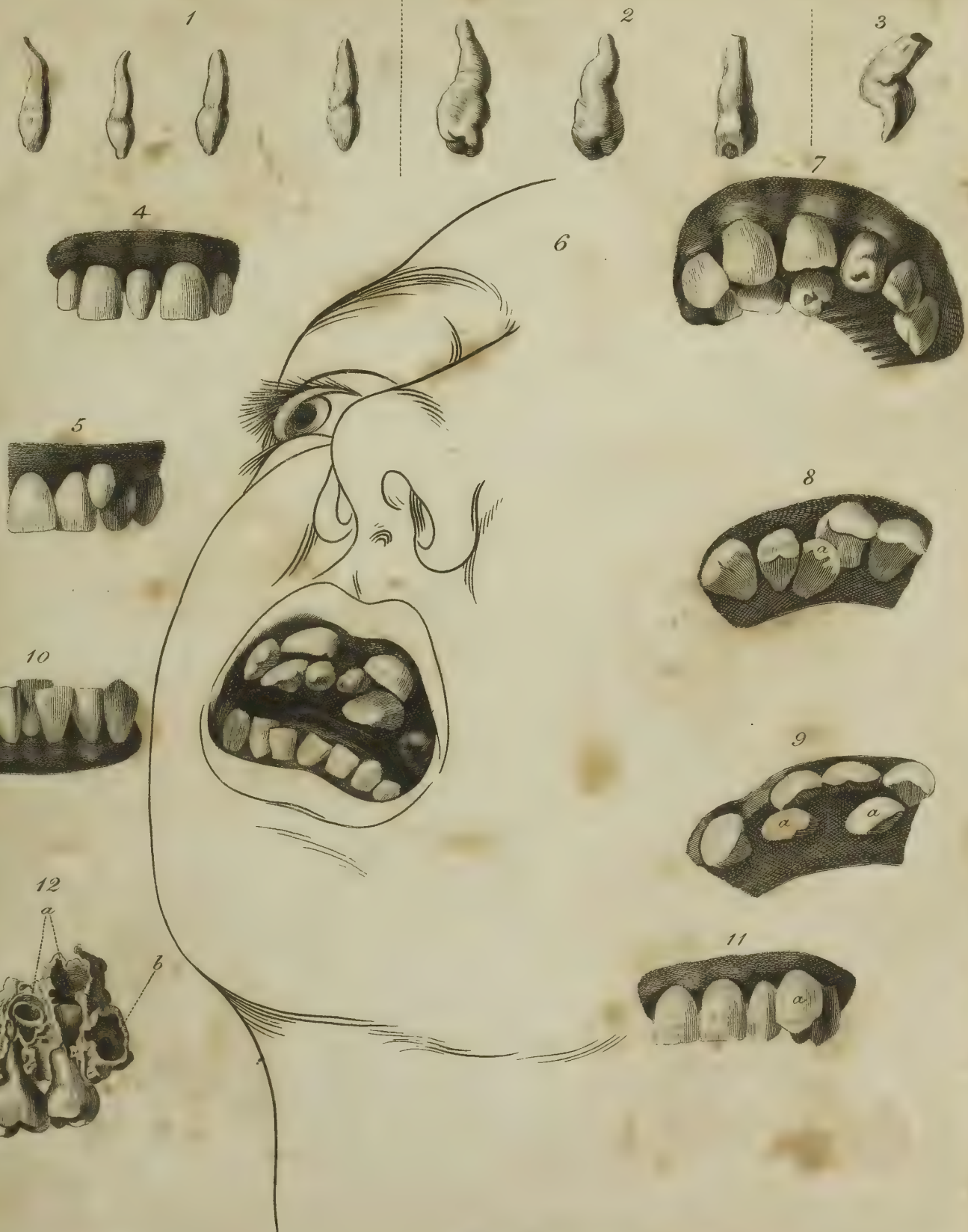

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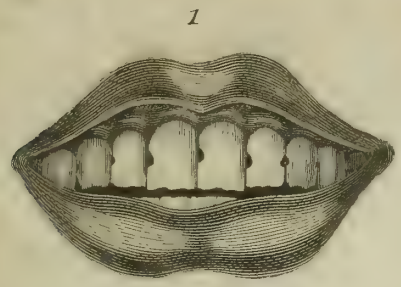
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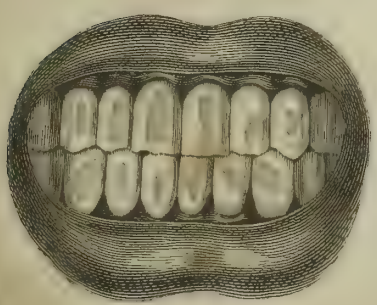
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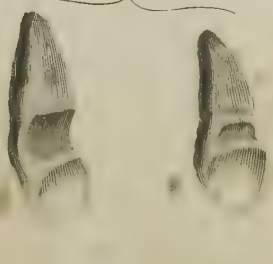
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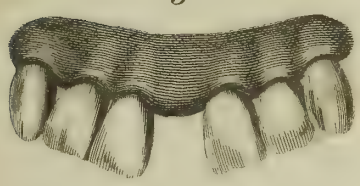

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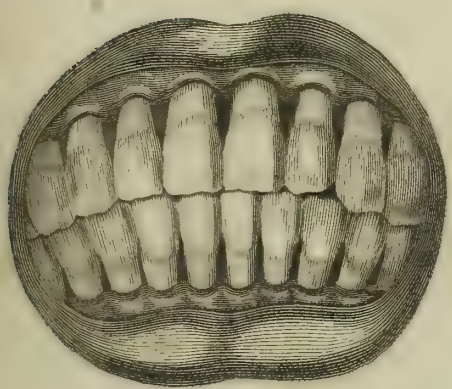

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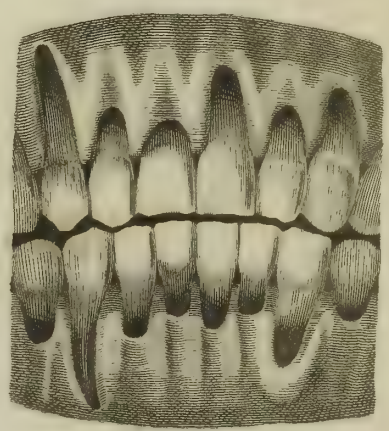

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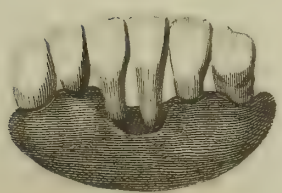

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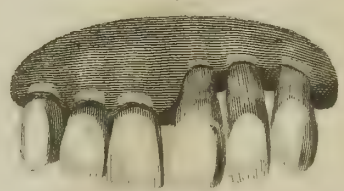

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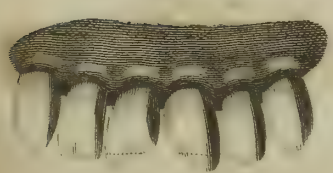

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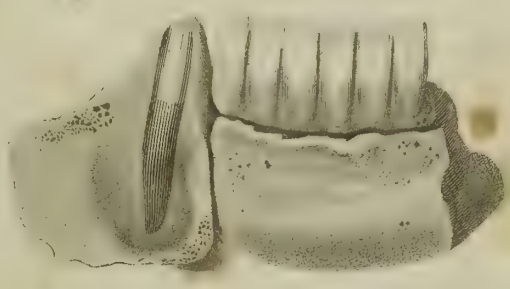
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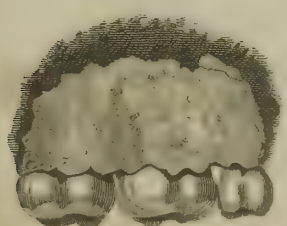
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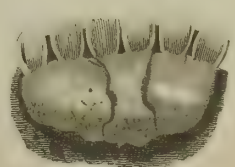
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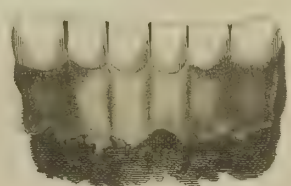
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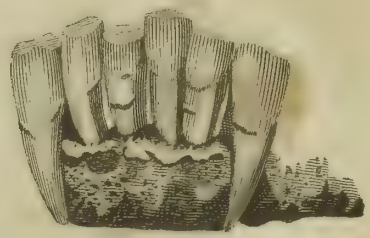

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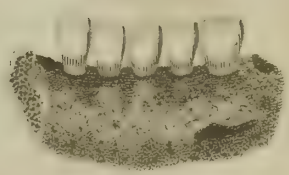

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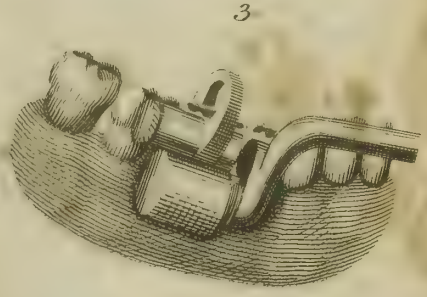
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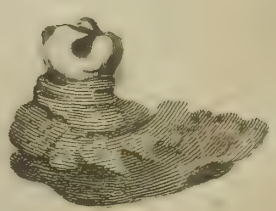
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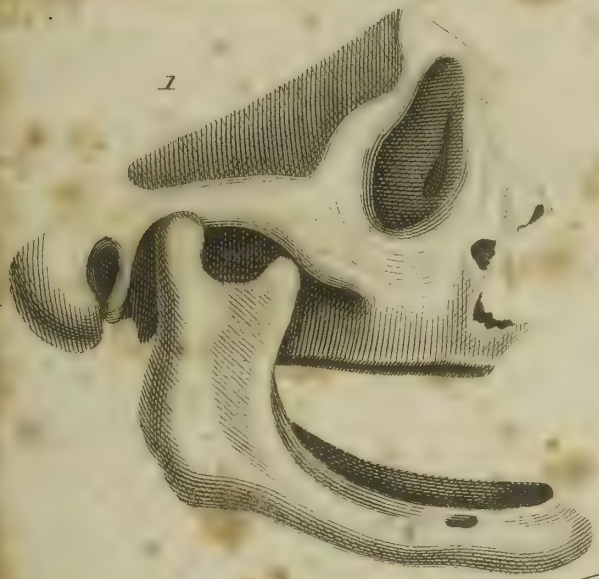

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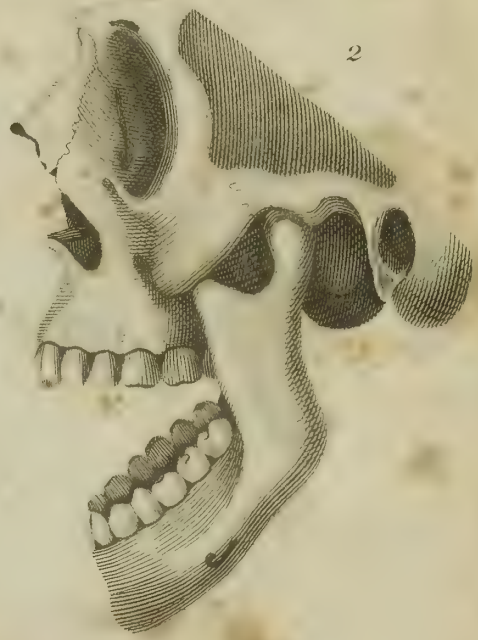

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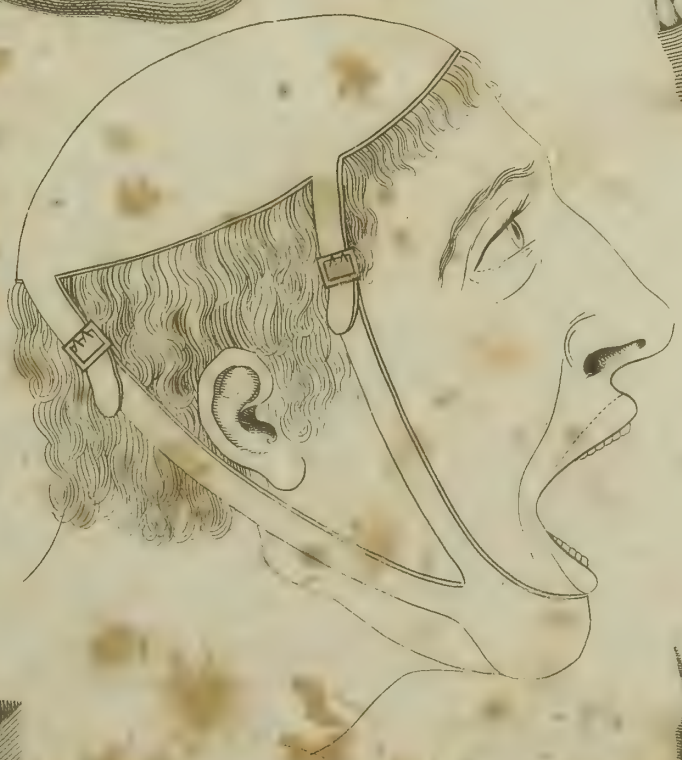

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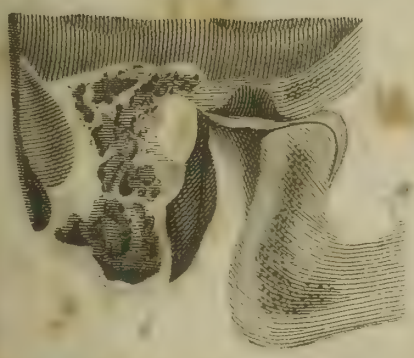

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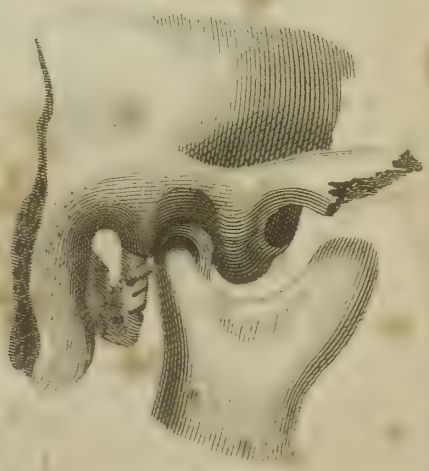

Fig. 1

Fig. 2

Fig. 3

Fig. 4

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CHAP. I.

Of the formation of the temporary Set of Teeth.

When the Fœtus has advanced so far in the organization of its different parts, as to take some determinate form or figure, we may perceive a considerable progress in the preparatory steps for the formation of the teeth.

As soon as the ossific deposit commences in the cartilaginous parts of the embryo, both jaws are filled with small membranous sacs; and, in the anterior parts, we may perceive the rudiments of alveolar processes.

In a Fœtus of about four months, the jaw bones are distinctly formed; but at this time they only consist of thin grooved bones, having a cavity extending through their whole length.* In the under jaw, anteriorly, this cavity is narrower

* The description of what takes place in one jaw, will completely exhibit what concerns the formation of the teeth in both; therefore, in order to avoid confusion, I shall refer to the under jaw only.

and deeper; but, posteriorly, it becomes wider and more shallow. At this time, if the membranous parts be removed, small processes of bone may be perceived shooting across from each side; which as the Fœtus increases in growth, gradually acquire more distinctness, and at length form separate sockets for the teeth.*

During the fœtal state, and also for some months after birth, the blood vessels and nerves belonging to the teeth, run along at the bottom of this cavity, immediately below the pulps of the teeth; but afterwards a distinct canal is formed, through which the principal vessels and nerves pass; separate filaments being sent off to the several teeth.

When the gum which covers the alveolar groove of a Fœtus of the age above-mentioned, is stript off from the bone, small processes or elongations from the inner surface of the gums may be distinctly perceived; these are the first appearances of the pulps from which the teeth are formed.†

The alveolar processes soon become perfectly distinct; for, the bony partitions which divide the longitudinal cavity in

* Plate I. Fig. 1. † Plate I. Fig. 2.

the jaw, rise to the upper margin; and thus those membranous processes, now enlarged and become more evolved, begin to be contained in separate cells.*

In a Fœtus of about four months old, the rudiments of the teeth may be very distinctly seen; upon examining those substances found in the jaws, they are seen to be soft, or pulpy bodies, bearing a resemblance to the figure of the body of the tooth to be formed, and each of them is contained in a membrane proper to itself.†

For some time during the formation of the teeth, the alveoli grow much faster than the teeth themselves, which are consequently but loosely contained within them. At the time of birth, the alveolar processes have increased so much, that they almost enclose or cover the teeth; thus a firm support is given to the gums, and the infant is enabled to make considerable pressure in sucking, &c. without injury to the progress which is going on underneath.

The ossification of the teeth begins to take place very early; it is first visible upon the tips of the *incisores*. In a Fœtus of

* Plate I. Fig. 3. 5. † Plate I. Fig. 4.

about five or six months, ossification has commenced upon the pulps of the incisores and cuspidati, and on the points of the molares; this gradually advances and extends itself, over the pulp, down to the neck of the tooth, from the cutting edges or highest points, where it had first commenced.

At the time of birth, the bodies of ten teeth are distinctly formed in each jaw; these are the teeth designed to serve during the years of childhood, and are commonly called the temporary, shedding, or milk teeth.*

These temporary teeth, which constitute the first set, are twenty in number, and are divided into three classes, *incisores*, *cuspidati* and *molares*. In each jaw there are four *incisores*, two *cuspidati*, and four *molares*, and the teeth on one side of the mouth correspond in figure with those of the other, so that they are situated in pairs.

Besides these twenty teeth, there are in a very early stage of their formation, the rudiments of some other teeth, which are to form part of the permanent or adult set.†

* Plate II. Fig. 1. † Plate II. Fig. 1. A. B.

After birth, as the ossification goes on, the teeth become too long to be contained within the alveolar cavity, they therefore begin to make pressure upon those parts which cover them; this produces the process of absorption, which proceeds with the enlargement of the tooth, first removiug the membranes which enveloped the teeth, and afterwards the thick gum which covered them, this gradually becoming thinner and thinner, till at length the teeth are suffered to pass through.

There is considerable variety as to the precise time when the teeth begin to make their appearance. This frequently seems to depend upon the health and vigour of the child: for sometimes the first tooth comes as early as four or five months, while on the contrary, in those of more delicate and weakly constitutions, no tooth makes its appearance until the child is ten or twelve months old; and it is not very uncommon for a child to be turned of fourteen months before any tooth appears.

It may be expected that the formation of the teeth will go on more rapidly in the healthy, and proceed more slowly in the weak and delicate: Yet there are exceptions to this, for often the teeth seem not to be influenced by any state of health. Those

of a weakly child will sometimes arise in rapid succession, while those of one more robust will often come forward but slowly.

In general, children begin to have their teeth about the sixth, seventh, or eighth month after birth;* those which correspond with each other generally appearing about the same time, first in the under jaw, and then in the upper.

The following is the order in which the teeth of a child generally appear.—The first teeth are the central *incisores* of the under jaw, one generally coming a few days before the other; then, in the course of a month, the two central *incisores* of the upper jaw. These are succeeded in a few weeks by the lateral *incisores* of the under jaw, and then soon after by the lateral *incisores* of the upper jaw. The *cuspidati* are generally slower in completing their growth than the *molares;* they

* Sometimes a child is born having one or two teeth; these are generally the central *incisores* of the under jaw: In such cases the socket for the forming tooth has not been sufficiently deep, and therefore the tooth has passed through the gum prematurely. These early productions are only the upper parts or crowns of teeth, no fangs having yet been formed. And as they have only a weak attachment to the gums, they soon get loose, producing a considerable inflammation in the mouth of the child, as well as occasioning inconvenience to the mother. It is therefore adviseable to extract them immediately, for they can never come to perfection.

are placed deeper in the jaw, and therefore are preceded by the first *molares.* The small *molares* of the under jaw usually come before those of the upper; they commonly appear about the fourteenth or sixteenth month, and are soon met by those of the upper jaw. After these, the *cuspidati* come through, first in the lower jaw, and then in the upper. At some time between two years and two years and a half, the second *molares* make their appearance, and thus complete the temporary set of teeth.*

The obtaining of the temporary teeth usually occupies a child from about the sixth or eighth month until between two or three years of age. The teeth most commonly follow the order above-mentioned; but this is not always to be expected: there are often great irregularities; sometimes the upper teeth appear before the under; now and then the lateral *incisores* precede the central. I once saw an instance of the first *molaris* of the under jaw appearing before the lateral *incisores;* and sometimes more teeth come about the same time than ought naturally to be expected. These cases of irregular succession of the teeth are often attended with considerable derangement of health, and alarming symptoms of irritation.

* Plate II. Fig. 2, 3, 4.

CHAP. II.

Of the Formation of the permanent Set of Teeth.

In the management of the teeth of children, it is highly necessary that the surgeon should have a perfect knowledge of the order in which the teeth of the permanent set are formed, and of the time when each tooth is expected to pass through the gums.

The formation and perfection of this set of teeth, occupy a very important portion of our limited existence; no less than twenty years, and often more, being necessary for their complete evolution. Nature begins to attend to the production of these permanent instruments of mastication, even before birth, and in many instances, they are not wholly completed before the twenty-fifth, or thirtieth year.

The permanent set of teeth vary much from the temporary set, some of the teeth being much larger, and others differing much in figure; they are in num berthirty-two, and therefore consist of twelve teeth more than the temporary set.

This set of teeth may be divided into two distinct classes; those which are to succeed the temporary, and those which are superadded; the formation of both these divisions begins nearly about the same time, and the progress furnishes one of the most curious changes the animal frame can exhibit.—The *incisores* and *cuspidati* of the child are succeeded by teeth similar in form, but larger in size, and they have the same appellation; but the teeth, which take the places of the temporary *molares*, are much smaller, and being divided at their grinding surfaces into two points, are called *bicuspides*. The *molares* of the adult are the teeth which are superadded, and these succeed one another as the jaws advance in growth.*

The teeth of the adult are divided into four classes: *Incisores*, *cuspidati*, *bicuspides*, and *molares*.

The teeth differ very much in the figure of their bodies, and in the number and shape of their fangs. The *cuspidati* are of a middle nature between the *incisores* and the *bicuspides;* as are the latter between the *cuspidati* and the *molares*.

The *incisores*, or cutting teeth, are situated in the anterior part of the jaw, and form the front of the mouth. In each

* Plate VII.

jaw they are four in number, and are so placed, that the two central stand somewhat more advanced than the lateral.

The bodies of the *incisores* are broad, and rather flat. The anterior surface is convex, the posterior concave; they both go off from the neck of the tooth somewhat sloping: The two surfaces terminate in a cutting edge, which is placed in a direct line with the apex of the fang. When viewed in front, the cutting edge is seen to be the broadest part of the tooth, but gradually becomes smaller as we approach to the neck. When viewed laterally, the cutting edge is the thinnest, and the tooth, to the neck of it, increases in thickness. This gives to the body of the tooth the form of a wedge, which is its true office, it being used to cut or divide soft substances.

The enamel is continued farther, and is thicker on the anterior and posterior surfaces than on the sides; it is even thicker on the fore part than on the back part of the tooth. The fangs are conical, and are shorter than those of the *cuspidati.*

In the upper jaw, the central *incisores* are much broader and larger than the lateral; in the lower jaw they are all nearly of the same size, but much smaller than those of the upper jaw.

The *cuspidati* are four in number, one of them being placed on the outer side of each of the lateral *incisores.*

The shape of the crown of a *cuspidatus* is like that of an *incisor,* with its corners rubbed off, so as to end in a point, instead of a broad edge. The fang is thicker and larger, and is more depressed at the sides, which causes it to appear considerably broader, when viewed laterally, than when seen in front. The fang, which is the largest of any of the teeth, may be felt with the finger, running up a considerable length, and projecting beyond those of the other teeth.

The *cuspidati* of the lower jaw very much resemble those of the upper, both in figure and in length. The enamel covers more of the lateral parts of these teeth than of the *incisores:* When they are first formed they are pointed, but by the friction of each upon the other in mastication, they become rounded, and sometimes acquire a flat edge.

The use of the *cuspidati* is not like that of the *incisores,* to cut and divide substances, nor like the *molares* for mastication; but they are similar to the canine teeth of carnivorous animals, and seem to be designed for the laying hold of and tearing of substances.

The *bicuspides* are situated immediately behind the *cuspidati.* They were formerly called the first and second grinders, but as they do not possess the true figure of grinders, and only have an intermediate resemblance between those teeth and the *cuspidati*, Mr. Hunter considered them as a particular class.

These teeth are very much like each other, and when viewed as they are situated in the mouth, are not unlike the *cuspidati.* They are eight in number; those belonging to the upper jaw have the body divided into two points, one external, the other internal. Their fangs appear as if compressed at the sides, and resemble two fangs united, with a depression running between them: commonly the first *bicuspis* has two small fangs, the second has seldom more than one; but in this they are subject to variety.

The *bicuspides* of the under jaw are smaller than those of the upper; the points upon their surfaces are not so distinct, and they have only one fang. The enamel is distributed nearly equally around the crown, and they stand in the jaw almost perpendicularly, but have a slight inclination inwards.

The *molares*, or grinders, are placed behind the *bicuspides;*

there are three on each side of the jaw, making twelve in the whole. The first and second *molares* are so much alike in every particular, that the description of one will convey a perfect idea of the other. The third grinder has several peculiarities, and therefore must be described separately. The *molares* are the largest teeth; they have a broad base, furnished with several points, which fits them for their office in grinding of food, and they have several fangs.

The *molares* of the under jaw have an inclination inwards, while those of the upper jaw are placed nearly perpendicularly with respect to the jaw.

The upper grinders have commonly three fangs, two situated on the outer part of the tooth, and one on the inner; the inner fang is very oblique in its direction, and is larger and rounder than the others. Those of the under jaw have two fangs, one placed forwards, the other backwards; they are rather flat, and continue broad all down their length.

Sometimes *molares* of the upper jaw are met with having four distinct fangs.* I have one with five fangs, which is the only one I ever saw.† The *molares* of the under jaw now and then have three fangs.‡

* Plate VIII. Fig. 11. † Fig. 13. ‡ Fig. 6.

The third *molaris* is called *dens sapientiæ ;* it is smaller than the others, its body is rather rounder, and the fangs are not so regular and distinct: they often appear as if squeezed together, and sometimes there is but one fang. The *dentes sapientæ* of the lower jaw often have their fangs curved, and sometimes they are so much inclined inwards, as scarcely to rise above the ridge of the coronoid process.

The *incisores* of the upper jaw being much broader than the same teeth in the under jaw, cause the other teeth to be placed farther back in the circle than the corresponding teeth of the lower jaw; hence, in a well formed mouth, when the teeth are shut close, the central *incisores* of the upper jaw come over the central and half of the lateral *incisores* of the lower jaw: The lateral *incisor* of the upper jaw covers the half of the lateral *incisor*, and more than half of the *cuspidatus* of the under jaw. The *cuspidatus* of the upper jaw falls between and projects a little over the *cuspidatus* and first *bicuspis* of the under jaw. The first *bicuspis* of the upper jaw falls partly upon the two *bicuspides* in the lower jaw: The second *bicuspis* shuts upon the second *bicuspis* and the first *molaris:* The first upper *molaris* covers two thirds of the first and part of the second *molaris* of the under jaw: The second upper *molaris* shuts upon the remainder of the second and part of the third;

and the third *molaris* of the upper jaw, being smaller than that in the under jaw, shuts even upon it.*

From this mechanism of the teeth their power in mastication is increased, and if one tooth be extracted, the antagonist tooth does not become useless, since it can in part act upon another.

The permanent *incisores* and *cuspidati* are formed behind the temporary *incisores* and *cuspidati;* the *bicuspides* underneath the temporary *molares*, and they are contained in sockets of their own.

The *molares* are, one after the other, formed in particular parts of the jaws: In the upper jaw, that posterior part called the tubercle, is the place for the formation of the upper *molares;* and the *molares* of the under jaw are formed in that part situated beneath the coronoid process, one succeeding the other, as the jaws in their growth carry the teeth forwards.

Those teeth of the permanent set which first begin to be formed are the anterior *molares*, the pulps of which may be found in a Fœtus a short time previous to birth, when they are situated quite at the posterior parts of the jaws. At

* Plate VII. Fig. 1.

the time of birth ossification has commenced upon their highest points; at this time also, on examining the membranes of the temporary *incisores*, small membranous sacs, containing a jelly-like substance, will be found attached to them at the posterior and upper part. These are the early rudiments of the permanent *molares;* ossification commences upon their tips soon after birth, but always first in the lower jaw.

When an infant has cut the central *incisores* of the upper jaw, and the four *incisores* of the under jaw, a considerable progress has been made in the ossification of the permanent *incisores* and first *molares;* in the under jaw it has begun on the points of the *cuspidati*, and in the upper jaw pulps for *cuspidati* have become distinct, the ossification of which usually commences when a child is aged about sixteen months.*

Between two and three years, when all the temporary teeth have appeared through the gums, the size of those permanent teeth already mentioned is much increased, and ossification has commenced upon the points of the *bicuspides* of the under jaw.†

After this time the teeth very much alter their position: At first the permanent teeth are contained in the same sockets

* Plate II. Fig. 2, and 3. † Plate II. Fig. 4.

as the temporary ; but as the formation of both sets advances, the permanent teeth, by the growth of the alveolar processes, become placed in a kind of niche ; there is also a small bony process shooting across the bottom of the common socket, which gradually increases, till at length nearly a complete separation is produced, and the permanent teeth are contained in sockets of their own. This may be very well observed in the head of a child of about four years of age; at this time the jaws have become deeper, in consequence of the complete formation of the temporary teeth and their alveolar processes, and the permanent set may be presented to view, upon removing the external plate of the jaws.*

About this age the ossification of the *incisores*, *cuspidati*, first *bicuspides*, and first *molares*, is much advanced, some progress has been made in the formation of the second *molares*, and soon after, the ossification of the second *bicuspides* commences.

At about six years of age those teeth designed to succeed the temporary ones, and the first and second *molares*, are in considerable forwardness, and if none of the temporary teeth have yet been removed, there are at this time in the head, forty-eight teeth, twenty *in sitû*, and within the jaws beneath the gums, in the progress of formation, twenty-eight.†

* Plate III. † Plate IV.

In the eighth or ninth year the formation of the third *molares*, or *dentes sapientiæ* begins, by this time some of the front teeth have been shed, and all the others are much advanced in growth.*

The permanent *incisores* and *cuspidati*, during their formation, are all situated on the inner side of the temporary teeth, consequently they are contained within the segment of a circle, smaller than that which holds the temporary teeth; they are also much larger, and therefore very much crowded and forced into irregular order. The lateral *incisores* are placed sometimes crossways, and always behind, in the space between the central *incisores* and *cuspidati*. In the upper jaw the *cuspidati* are placed so high as only to be just underneath the suborbitar process, and in the lower jaw they are placed almost as deep as the under margin.

This description which has been given of the progressive steps taken by nature in the formation of the teeth, may not exactly agree with that given by some respectable writers. Into Mr. Hunter's treatise, for want of closer attention, many inaccuracies have been suffered to creep. Besides, descriptions of this kind are liable to disagree, because the forma-

* Plate V.

tion of teeth in children of the same age may be in a more or less advanced state. But from various preparations and observations I have made, the above is the order in which the formation generally takes place.

CHAP. III.

Of the Manner in which the Teeth are formed.

THE teeth are formed in a manner peculiar to themselves, differing from the mode observed in the formation of bones in general; instead of having for their basis cartilage or membranous substance, as the cylindrical and flat bones have, they are formed from a soft pulpy substance, which possesses the shape of the body of the tooth to be produced.

Each pulp is covered by a membrane strongly attached to the gum, and to the pulp at its base, so that the pulp at its edge is loosely contained within the membrane, which is only reflected over it; at the base the pulp is weakly connected with the alveolar cavity in the jaw.

When a jaw has been minutely injected, we find that the pulps are vascular, and also the membranes by which they are enveloped. These membranes may with care be separated into two *lamellæ*, the external of which is rather of a loose and spongy texture, and possessed of vascularity; the internal *lamella* is more smooth, and is also vascular: the membranes derive their vessels from their gums, and the pulps receive their's from the artery which passes through the jaw.

Some preparations, in the injection of which I have very happily succeeded, fully warrant the above statement in all its variations from those of Mr. Hunter, or Dr. Blake the author of an inaugural dissertation, published in Edinburgh in 1798, containing many excellent physiological remarks on the formation of the teeth. Mr. Hunter observes, that the external membrane is soft and spongy, without vessels, the other much firmer, and extremely vascular. Dr. Blake says, "they (the membranes) can easily be separated into two *lamellæ*, the external of which is spongy and full of vessels; the internal one is more tender and delicate, and seems to contain no vessels capable of conveying red blood." In several preparations which are minutely injected, taken from the human subject, and also from the fœtal calf, I have found both the *lamellæ* to be very vascular.*

* Plate IX. Fig. 1, 2, 3, 4.

The manner in which the permanent teeth deirive their origin, was never properly understood until described by Dr. Blake, and is a discovery which shews very accurate observation.

When the rudiments of the temporary teeth are somewhat advanced, a new sac is given off at the upper and posterior part of their membranes. These sacs are at first contained in the same socket, and are so intimately connected with the membranes of the temporary teeth, that they cannot be separated without tearing one or both.* As the sacs of the permanent teeth advance, the sockets of the temporary ones become enlarged, and little niches are formed in the internal plate of the alveolar processes; these increase in proportion with the size of the permanent sacs, and gradually form a distinct socket round each of them.

There is however an opening left immediately under the gum, through which the membranes of both sets of teeth continue to be connected.† When the temporary teeth have risen in the socket, the membranes are much elongated, and remain attached to the gum at the neck of the tooth, small *foramina* being left in the jaw for them to pass through; thus they continue to derive their vessels from the gums.‡

* Plate IX. Fig. 5. † Fig. 10. ‡ Fig. 6.

The second and third permanent *molares* are in like manner formed from the first: A small process or sac is sent off posteriorly, which is at first contained in the same socket as the pulp of the first *molaris;* by degrees a new socket is formed, in which the pulp of the second *molaris* becomes perfect: This then sends off another process, which forms the third *molaris.**

A tooth is composed of two substances, one of which, called the enamel, is spread over that part which is not covered by the gums. The other substance is bone; it consists of the fang and all the body of the tooth situated within the enamel.

The bone of the tooth is formed from the pulp, and the enamel from the investing membrane. The bony part of the tooth is begun to be formed before the enamel. When the ossification of a tooth is commencing, bone is deposited from the vessels of the pulp upon its extreme points. In the *incisores* it begins upon their edges, and in the *molares*, upon the points of their grinding surfaces. The ossification usually begins in the *incisores* in three spots; these increase, soon unite and produce the cutting edge of the tooth: In the *molares* it begins in as many spots as there are grinding points, which in the lower jaw are commonly four, and in the upper, five: These soon unite and form one thin layer of bone of the upper

* Plate IX. Fig. 9.

surface of the pulp. The ossification soon extends to the sides of the pulp, and a thin shell of bone is spread over its whole surface.

If this shell be removed, the pulp, when uncovered, will be found very vascular. This is extremely well seen in the teeth of large animals, when in a state of formation. Some time ago I had the opportunity of examining the pulps of the teeth of a young elephant, which was dissected by Mr. Astley Cooper. Upon removing the ossification which had taken place upon the pulps, I found the vessels to be exceedingly full of blood: There was also a considerable degree of force required to separate the bone from the pulp, and this strength of union between the pulp and the ossified part, I have always found to be in proportion to the size of the tooth.

In the formation of the bone of a tooth the ossific matter is deposited in strata, one within side the other; thus a tooth is formed from the outer part to the inner, and this deposition of bone continues until the tooth becomes complete.—When the body of the tooth is formed, the pulp elongates, and takes that form of the fang proper to each particular tooth, and bone is deposited upon it: It then becomes gradually smaller, until it terminates in a point. If a tooth have two

or more fangs, the pulp divides, and the ossification proceeds accordingly. The cavity within a tooth, as it is forming, is at first very considerable; it becomes less as the formation advances, until it arrives at a certain point, when a cavity is left in it extending nearly through the whole length, and retaining the shape of the tooth.*

In the crown of the tooth, the cavity is of the same figure, and it divides into as many canals as there are fangs to the teeth, a canal extends through each fang connected with the cavity in the body of the tooth: Into this cavity the nerves and blood-vessels enter and ramify upon the membrane of the pulp, which remains to line the cavity after the formation of the teeth. In this manner the nerves give sensation to the teeth, and the internal parts of them are nourished.

The enamel is situated upon all that part of a tooth which in the healthy state of the gums is not covered by them. This portion of a tooth is called the body, or crown. It is formed by the membrane which invests the pulp: When a shell of bone has been formed upon the pulp, this membrane secretes a fluid, from which a very white soft substance is deposited upon the bone; this at first is of a consistence not harder than chalk, for it may be scratched or scraped off by the nail;

* Plate VIII. Fig. 4.

it however soon grows hard, and seems to undergo a process similar to that of crystallization, for it takes a regular and peculiar form.

The deposition of the enamel continues nearly as long as a tooth is contained within the membrane; it is always most in quantity upon those parts where its formation first began; it is thicker upon the edges and grinding surfaces of the teeth than upon the sides, and it gradually becomes thinner as it approaches the necks of the teeth. A tooth, when sawn through, shews the arrangement of the enamel; and as it requires more heat to blacken and burn this hardest part of the animal frame than the bony part of the tooth, we can, by exposing it to the effects of fire, obtain a still more distinct exhibition of it.* By the time the enamel is completely formed, the tooth has risen so much in the socket, that by its pressure its occasions an absorption of the membrane, which completely prevents any further addition of enamel.

When perfect, the enamel of the teeth is so hard, that a file in cutting it is soon worn smooth; and when struck with it, sparks of fire will be elicited; an effect I have several times produced with human teeth, and which may be very readily

* Plate VIII. Fig. 1.

seen by striking the teeth of large animals with steel, particularly those of the Hippopotamus.

The enamel, when broken, appears to be composed of a great number of small fibres, all of which are so arranged as to pass in a direction from the centre to the circumference of the tooth, or to form a sort of radii round the body of the tooth. This is the crystallized form it acquires some time after its deposit; by this disposition of its fibres, the enamel acquires a great degree of strength, and thus it is not so readily worn down in mastication, nor so easily fractured by violent action of the teeth.*

While some eminent physiologists have contended, that the teeth, when they have attained their full growth, are to be considered as extraneous bodies, and that they no longer receive nutriment, like the other bones of the body; others have supposed, that even the enamel is kept up in future life by continued deposit: but that this cannot be the case will be obvious, when it is considered, that the membrane which invested the pulp and entirely produced the enamel is destroyed before the tooth can appear. When a tooth first appears, the enamel is thicker than at any other period of life,

* Plate VIII. Fig. 2, 3.

and from that time it begins to decrease; this may be remarked in some of the permanent teeth. The *incisores*, when they first pass through the gum, have their edges notched; the *cuspidati* are sharp at their points, and the grinding surface of the *molares* is always irregular. This sharpness of the points of the teeth is occasioned by a larger deposit upon those parts where ossification had first commenced. By the friction of the teeth against each other, and against the food in mastication, the teeth are worn smooth, the notches upon the *incisores* disappear, the points of the *cuspidati* are rounded, or in many cases entirely removed, and the surfaces of the *molares* become much smoother.

The case is quite the reverse with the bony part, for when a tooth is first seen through the gum, scarcely more than two thirds of the fangs are formed, but the ossification continues for a considerable time afterwards.

The enamel upon some teeth has a very defective formation; instead of being a hard white substance, having a smooth polished surface, it is frequently met with of a yellow colour, and having a great number of indentations upon its surfaces. This occasions the teeth to resemble the exterior of sponge, and gives them what has been termed a honey-combed appearance.

Sometimes this appearance of the enamel is only met with on the front teeth, near the cutting edge; at others it extends nearly over half of the tooth, the remaining parts being perfect. When the roughness is near the edge, it often wears out in a few years, or at the age of maturity it may be filed out. In some, one, two, or three indented lines pass across the front of the teeth.*

This defective formation of the enamel is usually confined to the *incisores*, *cuspidati*, and first permanent *molares;* it is rarely met with on the *bicuspides*, or second and third *molares*.—No certain reason can be assigned why the membrane secreting the enamel should so often deviate from its natural action. It can only be referred to some peculiarity of constitution, occasioning an irregular action in the membranes of the pulps, during the first months; for this appearance is only met with on those teeth, the formation of which commences about the time of birth: and even upon them, in those parts only which are first formed. In a few months after, the membranes acquire an healthy action, and the teeth which are formed later, rarely have defective enamel.

It is very remarkable that this circumstance often occurs in several children of the same family; indeed there is

* Plate VIII. Fig. 14.

scarcely any part in which they resemble each other more, than in the appearance and arrangement of the teeth. I have however constantly observed that these kind of teeth are not so liable to decay, as those which have the enamel very beautiful and transparent. We here find nature, as she does in many other particulars common to humanity, making up for defects in one part of her work, by bestowing greater perfection upon another.

Sometimes in the formation of the teeth two pulps unite, and upon their surfaces, appear as two distinct teeth, but upon attempting to remove one, it is discovered to be united to the next. In Plate VIII. are figures of several teeth of this kind, which must be regarded as *lusus naturæ*.*

Very often the fangs of the teeth become crooked, from some obstruction to their growth; and teeth having two or three fangs, are now and then met with, so much bent at their points as to occasion them to be very firmly placed in the jaw. When these circumstances occur, the extraction of the teeth is unavoidably an operation of the utmost difficulty.

The arteries which supply the teeth with blood, are called the dental; they are branches of the internal maxillary artery,

* Plate VIII. Fig. 8, 9, 10.

which arises from the external carotid, at that part where it is covered by the parotid gland, and lies behind the middle of the upright plate of the lower jaw, where it divides into the condyloid and coronoid processes. It passes first between the jaw and the external pterygoid muscle, and afterwards runs in a very winding direction towards the back part of the antrum maxillare; it here sends numerous branches to the parts belonging to both jaws, and to the teeth of the upper jaw. It then gives off one branch to the lower jaw, called by some, the inferior maxillary, and by others, the dental. This enters the jaw-bone at the posterior maxillary foramen, passes through the maxillary canal, and gives off branches to the fangs of each tooth, and also supplies the substance of the bone: This vessel having sent a branch to the *incisores*, passes out at the anterior maxillary foramen; it is distributed to the gums, and communicates upon the chin with branches of the facial artery.

The nerves, which are distributed to the teeth, arise from the fifth pair, the *trigemini*. This pair of nerves divides into three branches; the ophthalmic, the superior maxillary, and the inferior maxillary. The ophthalmic branch passes through the foramen lacerum of the orbit, and is distributed to the parts in the neighbourhood of the eye. The superior maxil-

lary nerve goes out at the foramen rotundum of the sphenoid bone, and divides into several branches, being continued to the posterior part of the nose, the palate, velum palati, and contiguous parts. At the posterior part, small filaments of nerves, accompanying branches of arteries, enter the superior maxillary bone by *foramina* which lead to the *molares*, and also to the membrane lining the *antrum maxillare:* The nerve then goes into the canal under the orbit, and forms the *infra orbitar* nerve. Whilst in the canal, it sends off branches to the *bicuspides*, *cuspidati*, and *incisores;* it afterwards passes out at the *foramen infra orbitarium*, and is distributed upon the cheek, under eyelid, upper lip, and side of the nose.

The inferior maxillary nerve passes through the *foramen ovale* of the sphenoid bone, and is distributed to the muscles of the lower jaw: it sends off a large branch, the lingual, which goes to the tongue, which is the true gustatory nerve; it then enters the maxillary canal of the lower jaw, passes through the bone under the *alveoli*, and gives off branches, which entering the fangs, ramify upon the membrane within the cavities of the teeth; it passes out at the anterior maxillary foramen, and is spent about the chin and lip.*

* Plate VIII. Fig. 5.

There is another set of vessels, called absorbents, of the existence of which, in the structure of common bone, I believe there is no doubt; and on account of certain effects produced upon the teeth, we must conclude that they are not destitute of them.

During the progress of the second dentition, the fangs of the temporary teeth are absorbed; and even the permanent teeth, when diseased, often lose a considerable portion of the fangs. It may be argued, that in these cases the absorbent vessels are situated in the socket, and act upon the tooth as if it were an extraneous body. But in some cases, we find the teeth undergo the ulcerative process, and a considerable quantity of the inner part is removed, a circumstance which could not happen unless there were absorbents entering into the cavities of the teeth, and properly belonging to them.

Besides these instances, the effects of absorption in the tusks of elephants are often seen; sometimes in sawing these bodies, iron balls, spear heads, &c. are met with, which have been forced into them in attempting to kill these animals. These extraneous substances are always found loose, having a space in which they can be moved. This could never happen, unless

there were some action going on, by which part of the bone could be removed, and there is no other mode in which it can be effected, but through the medium of the absorbent vessels.

The teeth are fixed in their sockets by that species of articulation called gomphosis. They are attached to the alveolar cavity by a strong periosteum, which is extended over the fangs, and which also lines the socket; it is connected to the gums at the neck of the tooth, and it is vascular, like the periosteum in other parts of the body.

It is very extraordinary that Mr. Hunter should have considered the teeth as devoid of internal circulation, and destitute of the living principle. The structure of the teeth is similar to that of any other bone, and differs only in having a covering which is called enamel, for the exposed surface, and in the bony part being more dense. There are several parts of the body in which we cannot by injections demonstrate the existence of blood-vessels, of the vascularity of which no one can entertain a doubt; and as bones in general are continually receiving nourishment from the vessels which enter into their substance, it may be justly inferred that the blood sent to the teeth affords a similar supply, especially as a

considerable portion of animal matter enters into their composition.

A large quantity of blood is distributed to the teeth; this may frequently be seen in performing some operations. In cutting off the crown of a tooth, in which the caries had not spread to the fang, for the purpose of engrafting a new tooth, I have several times seen a discharge of blood from the internal cavity. This blood came from the vessels of the membrane in the cavity, which I have also several times seen injected. Blood carries with it the basis of nutrition, and is sent to those parts only where renovation is necessary. For what other reason then, but to impart some principle of nutrition, can so much blood flow into the teeth? If the teeth, after their first formation, received no supply from vessels, or did not require any nourishment, it would have been better if they had been destitute of an internal cavity, and of regular organization.

It is always observed, that as persons advance in life, their teeth lose that whiteness which they possessed in the time of youth. This change in the appearance of the teeth seems to depend upon one which takes place in their cavities, by which the vessels entering them are gradually destroyed, and the

supply of blood is proportionally diminished. In the teeth of persons advanced in years, the cavity is very frequently obliterated, in consequence of a deposit of bony matter, which entirely destroys the internal organization. When this happens, the teeth always lose their colour, and become very yellow, their texture also becomes more brittle, and they acquire a horny transparency.

When a tooth has been loosened by a blow, and has afterwards fastened in its socket, a great alteration in its colour is the consequence; it gradually loses its whiteness, and acquires a darker hue; this proceeds from the vessels which enter the teeth, being destroyed, and the teeth consequently losing their supply of blood.

The teeth being constructed like common bones, are governed by the same laws, and are liable to be affected by similar diseases; like them, they are affected by the various causes of inflammation, and have the same diseased appearances produced upon them.

In bones, the power of resisting the effects of disease is in an inverse proportion to their density. The living principle is always less in the close textured cylindrical bones,

and greater in those which are flat and spongy. The teeth being the most dense bones in the body, have the least power of resisting disease, and, in them, the general termination of inflammation is in mortification.

The teeth do not possess the power of exfoliation, it is not necessary they should, for the system suffers no injury by the loss of a tooth; and no person would have sufficient patience to bear the pain attending upon, or wait the progress of so slow a process. Like other bones, the teeth are subject to that species of inflammation called the ossific, by which the fangs become increased in size, acquire an additional quantity of bone, and exhibit all the appearances of exostosis. They are also liable to inflammation of the membrane lining the cavity, and to its suppuration, during the progress of which the inner part of the tooth is removed by the absorbents, and an appearance is produced like that disease of bones called *spina ventosa.*

CHAP. IV.

Of the Shedding of the Teeth.

THE falling out of the temporary teeth, to make way for those which are to be permanent, is commonly called the shedding of the teeth. It is the consequence of one of the most curious actions of nature, and is of great importance to our comfort, since the beauty of the face, and the proper articulation of speech in a considerable degree depend upon the regularity with which this part of her work is accomplished.

The necessity of teeth for the mastication of food commences as soon as the time of support from the mother ceases, and therefore a set is provided at a very early period, which occupies but a few months in formation, and only continues a few years without falling into a state of decay. These teeth are only proportioned to the size of the mouth during childhood, and would consequently be too small and too few in

number, for the extended state of the jaws in the adult; hence the formation of new teeth becomes indispensable, and according to the manner already described, a set of teeth is formed, of a magnitude and number proportioned to the mature state of the body, and intended, from their compact structure to continue through life.*

It is during the growth of the permanent teeth that the very curious process of absorption is going on in the temporary ones, which facilitates their removal from the socket, and affords a free passage to the permanent teeth.

It has been observed, that the pulps of the new teeth are placed behind the temporary ones, and in that situation they are very much crowded, and occupy but a small space. Now it is evident that as they advance in growth, they will require

* The same circumstances take place in all animals: They, like the human subject, shed their teeth, and obtain a new set. But in some animals there is a variety in the mode, arising from the peculiar structure of their teeth and jaws. This is particularly and very curiously the case in the elephant, which animal, instead of having its new teeth formed under the temporary ones, they are formed in sockets beyond those to be shed, which in due time advance from the back to the front part of the jaw. This is very accurately described by Mr. Corse, in his paper in the Philosophical Transactions. A similar mode is observed to take place in one grinder of the *Sus Ethiopicus*, as described by Mr. Home, whose paper, with that of Mr. Corse, are in the Transactions for 1799.

an increase of room, to obtain which they must come forwards, so as to form a larger circle.

This effort first produces a considerable pressure against the bony partition, placed between the temporary and permanent teeth, and then upon the posterior part of the fangs of the shedding teeth. The pressure in this instance acts precisely in the same manner as it generally does in other cases where it is applied. It induces an absorption of the parts pressed against; and as the new teeth augment, the fore part of the socket which was formed around the pulp, and separated it from the temporary tooth, is removed by the process of absorption.* The second teeth still continuing to protrude, press against the fangs of the temporary teeth, at which place their substance begins to be taken up: The absorption goes on until the greater part, or the whole, of the fangs are removed; at the same time the new teeth come forward, underneath the temporary ones, which soon drop out, when the edges of the new teeth may generally be distinctly felt.

The absorption gives to the fangs of the teeth an appearance of being broken, but this, when compared with a frac-

* Plate II. Fig. 1, 2, 3, 4.

ture, will be found to differ from it very materially. While the absorption of the fangs of the temporary teeth seems to depend so much on the pressure of the rising permanent ones, it is often found to go on without such pressure; for in some children the temporary teeth will loosen and drop out many months before new teeth appear, and in many cases the same effect takes place where a new tooth does not rise to replace the one which has been shed.

These circumstances seem to prove that the absorption of the fangs of the temporary teeth is an action of nature, sometimes independent of pressure: and it is a very singular circumstance, that at a time of life when so great a quantity of ossific matter is poured forth from all the arteries concerned in the formation of bone, in one particular part, there should thus be an absorption of this substance taking place.

In many instances, however absorption of the fangs of the temporary teeth never takes place; and it is by no means uncommon to find one, two or sometimes more of them, remain in their sockets for a great number of years. When this happens to be the case with several teeth, it is found that no permanent teeth had been formed: which shews that the ab-

sorption of temporary teeth, although a regular action in the animal œconomy, is very considerably influenced by the pressure of forming teeth. This defect always produces an unseemly appearance, from the small size of the old teeth, when compared with the new.

Cases of deficiency of the permanent teeth are by no means unfrequent. I have seen a young lady of about twenty years of age, who had never shed the two central *incisores* of the under jaw; and in the upper jaw, all the temporary *incisores* remained, except one of the lateral, which had been shed.

It frequently happens in the upper jaw, that the permanent central *incisores* only are formed, the lateral ones never appearing. Many persons are deficient in one or more of the *bicuspides*. I know a gentleman who resides at Bath, who has never had the *incisores* of the under jaw; and it is remarkable, that two other persons of his family are in the same situation. I have seen a lady who had only four teeth of the permanent set in each jaw. Mr. Taunton, Surgeon of the City Dispensary, has the preparation of a child's head, in the upper jaw of which only one *incisor* was forming.*

* Plate X. Fig. 6.

These deviations often occur in the human subject; but so far as I have observed, they are very rare in animals, yet I once saw a horse rising between eight and nine years, which still retained one of the milk *incisores*.

The appearance of the fangs of the teeth, when absorbed, has given rise to a popular but erroneous opinion, that the first teeth have no fangs, and this was even taught by some of the old anatomists. It has also been erroneously conceived that the temporary teeth are pushed out by the permanent: Now that this cannot take place, will be seen by observing the state of the two sets of teeth. The temporary ones are firmly placed in sockets, whilst the new teeth, during their formation, are contained in cavities larger than themselves, and can only make such pressure as their gradual growth will permit. On this account, if the absorption of the old tooth be retarded, or the formation of the new tooth proceed too quickly, the latter will take an improper direction when they come through the gums, and form a second row of teeth, from the temporary teeth still remaining. Moreover, if the old teeth were pushed out by the new, we should always find those teeth about to be displaced, forced out of the line of the others, a circumstance which never occurs.

The period at which children begin to shed their teeth varies considerably. In some, the teeth become loose as early as five or six years of age; in others, this process does not begin until the eighth year: About six or seven years of age may be taken as the standard time.

The teeth of the permanent set, which usually appear first, are the anterior *molares*, which being somewhat more early in their formation, generally precede the *incisores;* and we must always expect, soon after the cutting of one or other of these teeth, that the shedding of the temporary teeth will begin.

Soon after the first permanent *molares* have appeared, the two central *incisores* of the under jaw become loose, and when they are but slightly attached to the gum, easily come away; the permanent central *incisores* soon after appear, one coming a little time before the other; in about two or three months the central permanent *incisores* of the upper jaw become loose, and having dropt out, the permanent central *incisores* succeed them.

In about three or four months more, the under lateral *incisores*, having lost their fangs, come away, and the permanent lateral *incisores* succeed them. The lateral *incisores* of

the upper jaw are the next which drop out, and the permanent ones appear shortly afterwards. In about six or twelve months more, the temporary *molares* begin to loosen; they generally come out before the *cuspidati*, the long fangs of which take a much longer time in being absorbed.

The first *bicuspides* take the place of the first *molares*, and about the time they appear, the second temporary *molares*, and the temporary *cuspidati*, become loose, and having been shed, are succeeded by the permanent *cuspidati*, and the second *bicuspides*.

The shedding of the teeth, commencing at six or seven years of age, is commonly completed in about five or six years, when all the temporary have come out, and those of the permanent set as far as the second *molares*, have taken their stations. There yet remain, to complete the set, the third *molares*, or *dentes sapientiæ*, and these usually appear between eighteen and twenty-one years of age, but sometimes they do not come till much later; not before twenty-seven or thirty years; and I once was consulted by a gentleman, fifty years of age, who had great pain from cutting one of these teeth.

CHAP. V.

Of the Irregularity of the Teeth.

DURING the shedding of the teeth there are several circumstances which prevent the permanent teeth from acquiring a regular position, and often give rise to very great irregularity in their arrangement.

The most frequent cause is a want of simultaneous action between the increase of the permanent teeth, and the decrease of the temporary ones, by the absorption of their fangs. It rarely happens that so much of the fang of a temporary tooth is absorbed as to permit its removal by the efforts of the child, before the permanent tooth is ready to pass through: on which account the new tooth takes an improper direction, and generally comes through on the inside.

Cases are very frequent in which scarcely any absorption of the fangs of the temporary teeth had taken place previous to the appearance of several of the permanent teeth; and it often happens, that upon the removal of the shedding teeth to give

room for the permanent ones, that no absorption of the fangs of the temporary teeth has taken place.

Irregularity of the permanent teeth is most commonly occasioned by the resistance made by the nearest temporary teeth; this is always the case if the temporary teeth are small and close set, for as the permanent *incisores* are much larger than the temporary, they require more room; but as the space left by the shedding of the temporary teeth is too small for the regular position of the permanent, they are exposed to the pressure of the next tooth, and hence are frequently turned out of their right direction.

Another cause of the irregularity of the teeth arises from the permanent teeth being too large for the space occupied by the temporary ones; those parts of the jaws not being sufficiently extended to permit a regular position of the new teeth—in this case the irregularity is considerable, and occasions great deformity in the appearance of the mouth. The *incisores* and *cuspidati* being much larger than those of the child, require more room, for want of which they are turned out of their proper positions. The central *incisores* overlap each other—the lateral *incisores* are either placed obliquely with their edges turned forwards, or they are pushed back, and stand

between and behind the central *incisores* and the *cuspidati;* the *cuspidati* are projected, occasioning the lip to stand out with considerable prominence, and the *bicuspides* are placed very irregularly.

It will be proper, in this place, to observe the manner in which the jaw bones grow, (the under one being taken as the example) and to point out the difference between the temporary and permanent teeth.

After a child has obtained all the temporary teeth, the jaw in general grows very little, in the part which they occupy. In those children who are an exception to this rule, the temporary teeth become a good deal separated from each other, and these are the cases in which the shedding of the teeth is effected without any assistance of art.

When the jaw of a child is compared with that of an adult, very striking difference is observed; that of a child forms nearly the half of a circle, while that of an adult is the half of a long ellipsis. This comparison clearly points out the part in which the jaw receives its greatest increase, to be between the second temporary *molaris* and the coronoid process; and this

lengthened part of the jaw is destined to be the situation of the permanent *molares.*

By the elongation of the jaw a great change in the form of the face is produced; that of a child is round, the cheeks are plump and the chin flat; in an adult the face is more prominent, with a flatness of cheek and a considerable length of chin.

The temporary *incisores* and *cuspidati* are much smaller than the permanent, while the *molares* of the temporary set are larger than the *bicuspides*, which succeed them. Hence it is, that the *incisores* and *cuspidati* are so frequently irregular, and they never could be otherwise were it not that some space were gained from the *molares*, in consequence of the *bicuspides* being much smaller.

This circumstance is rendered intelligible, by examining jaws at various ages, and observing in what particulars they differ from each other.

Until about twelve months after birth, the jaw grows uniformly in all its parts, and at that time as far as the teeth extend, it approaches nearly to a semicircle; at about three years

of age, when all the temporary teeth have appeared, it begins to lose its semicircular form, and become somewhat elongated; an extension takes place between the last temporary *molaris* and the coronoid process; and in that part, in an advanced state of formation, the first permanent *molaris* will be found.

At about seven or eight years of age, the jaw is more extended, the first permanent *molaris* has grown up, and the second is advancing in formation. At about eleven or twelve years of age it will be found still longer; the second *molaris* is ready to come through the gum, and the third *molaris* has begun to form.

The jaw acquires its full proportion, at about eighteen or twenty years of age, when the third *molaris* makes its appearance, and the teeth are seen in the figure of their arrangement to form part of an ellipsis.

The growth of the jaw being nearly confined to the part situated behind the temporary teeth, where the permanent *molares* are placed, the anterior part of the jaw undergoes little more than an alteration in form; it adapts itself to the permanent teeth there situated, and scarcely receives any increase of size.

The same comparison of jaws exhibits the cause of irregularity in the permanent *incisores* and *cuspidati.* When a child is about to shed its teeth, the first permanent *molares* come through the gums behind the temporary *molares*, and therefore the teeth which are situated anteriorly to the permanent *molares*, can obtain no additional space.

The permanent *incisores* occupy the space of the temporary *incisores*, and half of that of the *cuspidati.* It commonly happens that the *bicuspides* are earlier in their appearance than the *cuspidati;* therefore, when the first temporary *molares* are shed, a little room is gained, as the teeth which succeed them are smaller. When the second *molares* are shed, still more room is gained; the two *bicuspides* go back against the first permanent *molares*, and thereby give sufficient room for the *cuspidati.* Thus, by the change of the *molares* of the child, which are large, for the *bicuspides* of the adult, which are small, room is obtained for the increased size of the permanent *incisores* and *cuspidati.*

This change of small teeth for larger, and of larger for smaller, points out the necessity of giving some assistance to nature in one of her processes, viz. that of throwing out the temporary teeth before the permanent teeth appear; if this

be done at a proper time, the teeth will always take a regular position, and every deformity arising from irregularity be prevented.

During the progress of the second dentition, an opportunity presents itself for effecting this desirable object; but every thing depends upon a correct knowledge of the time, when a tooth requires to be extracted, and also of the particular tooth; for often more injury is occasioned by the removal of a tooth too early, than if it be left a little too long; because a new tooth, which has too much room long before it is required, will sometimes take a direction more difficult to alter, than a slight irregularity occasioned by an obstruction of short duration. If an improper tooth be extracted irreparable mischief will ensue; as in the case where young permanent teeth have been removed, instead of the obstructing temporary ones, which I have several times known to have been done.

CHAP. VI.

Of the Treatment to prevent Irregularity of the Teeth.

THE advantage which attends the removing the teeth of children, depends upon its being done at the precise time when nature is tardy in effecting the absorption of the fangs of the temporary teeth. The performance of any improper operation will be prevented by a knowledge of the progress of the formation of the teeth, combined with observations upon the appearance of the gums, which become full when a tooth is about to pass through them.

To assist the permanent teeth in acquiring their proper arrangement, the mouth should be examined from time to time, that the operation be performed at the time required; for it is not sufficient to remove an obstructing tooth, when the new one is perceived to be coming irregularly, because it always requires a considerable time to bring the latter into its proper place, and often the irregularity remains unaltered.

The shedding of the teeth commonly begins at about seven years of age: sometimes it may be earlier, and at others rather later; however, it is about this time that a child's mouth begins to require frequent inspection.

There are two circumstances, the presence of either of which always denotes that the shedding of the teeth is about to commence. The first permanent *molares* of the under jaw make their appearance; or one or both of the central *incisores* in the under jaw begin to loosen.

Sometimes the absorption of the fangs of the temporary teeth goes on so slowly, that they do not get loose previous to the passing of the new tooth through the gums behind them. If then the permanent *molares* have been cut for some time, and there be a fulness of the gums behind the under permanent *incisores*, it will be expedient that the two central *incisores* be extracted immediately, although not yet loose. It most commonly happens that the under central *incisores*, by the early absorption of their fangs, become loose, and are taken out by the child some time previous to the appearance of the new teeth; but it often occurs, that although they have got somewhat loose, they are not sufficiently so, to come out of themselves before the new teeth are ready to pass through. When in this state,

the temporary central *incisores* should be removed, and this will permit the permanent central *incisores* to take their proper place. It will soon be seen, as the new teeth arise, whether they have sufficient room; if not, it will be necessary to remove the temporary lateral *incisores*.

In two or three months afterwards, or sometimes later, attention must be paid to the central *incisores* of the upper jaw. If they have got loose they should be taken out, or if not, and there be the least fulness of the gums behind them, they must be extracted, or else one or both of the permanent *incisores* will come through, and produce one of the most unseemly cases of irregularity, as well as one of the most difficult to treat.

When the permanent central *incisores* are passing through the gum, there is seldom sufficient room for them, and it will be proper to extract the temporary lateral *incisores*.

The attention is next to be turned to the under jaw, for in three, or six months time, the lateral permanent *incisores* may be expected to appear, and if there be any fulness of the gum, where those teeth are to pass, the temporary *cuspidati* must be taken out. In two or three months more the same observa-

tions should be made upon the upper jaw, and as soon as the permanent lateral *incisores* exhibit signs of approach, by a fulness of the gums, the temporary *cuspidati* should be extracted.

When the teeth are in this state, they may often remain without farther attention for near a twelvemonth, during which time the *incisores* will be acquiring their complete growth; and the *cuspidati* and the *bicuspides* be ready to come through. Care must now be taken that the permanent *cuspidati* do not take an improper direction; the gums should be examined, and if any prominence be felt, the first temporary *molares* must be extracted. It frequently happens that the first temporary *molares* get loose previous to any appearance of the *cuspidati*, and that when they are removed, the *bicuspides* soon appear.

After this, the treatment must be guided by circumstances. If either of the *cuspidati* exhibit signs of early approach, and there be scarcely room between the lateral *incisor* and the *bicuspis* already in its place, it will be proper to take out the second temporary *molaris*, the first *bicuspis* will then go somewhat back and the *cuspidatus* will get more room.

When the second temporary *molares* have been removed, there remain no other obstacles in the way of the completion of the second dentition. The second *bicuspides* will come properly into their places, and the *molares* having no obstruction, will progressively occupy their proper stations.

Though the shedding of the teeth generally requires a period of four or five years, it sometimes occupies nearly six years. In some children the changes take place quickly, and in others slowly. I have seen a child of only seven years of age more advanced in the process of dentition, than another of the same family when near eleven.

CHAP. VII.

The Treatment to remedy Irregularities of the Teeth.

THE mode of treatment described in the preceding chapter, is not always had recourse to, at a time when every irregularity might be easily obviated. Parents most commonly wait, until, by an irregular growth of their children's teeth, a manifest deformity is produced, ere they perceive the necessity of advice.

In all cases of irregularity during the shedding of the teeth, the treatment to be observed is to remove the obstructing temporary teeth, and then to apply pressure in the most convenient manner upon the irregular tooth, in order to direct it into its proper situation.

I will now describe the different states of irregularity, and to avoid confusion, take each jaw separately.

In the under jaw, when the growth of the permanent central *incisores* has exceeded the absorption of the temporary ones, they grow up immediately behind them, in a direction towards the tongue. These two new teeth are generally so broad as nearly to cover the inner surface of the four temporary *incisores.* It will therefore be necessary, in order to obtain room for these teeth, that the four temporary *incisores* be extracted. The new teeth will then gradually come forward, in which they will naturally be assisted by the pressure of the tongue of the child, and may be occasionally helped by the finger of the parent or nurse.*

If the temporary central *incisores* have loosened, and come out previous to the appearance of the permanent teeth, the space is seldom sufficiently wide, and the new teeth will either grow up with their sides turned forward, or one will be placed before the other. In this case the two lateral *incisores* must be taken out.†

When the permanent central *incisores* have completely grown up, they occupy full two thirds of the space, which contained the four temporary *incisores;* therefore, when the permanent lateral *incisores* appear, they are placed partly behind the

* Plate XI. Fig. 1. † Fig. 2.

incisores and the temporary *cuspidati;* or they grow up with one corner turned forwards, and the other pointing backwards. In either of these cases the temporary *cuspidati* must be removed to give room.*

The four permanent *incisores* take up nearly the whole of the space of the temporary *incisores* and *cuspidati.* The permanent *cuspidati* are large teeth, and when they have not sufficient room, they occasion very great irregularity. Sometimes they come through on the inside, but most commonly they cut the gum on the outside, and project very much out of the circular line from the temporary *incisores* to the temporary *molares.* In this case the necessity of the removal of the first temporary *molares* is obvious.†

It is not very common that the *bicuspides* of the lower jaw are irregular, because the temporary *molares* are generally removed before they appear; but when this is not the case, they always come through the gums on the inside, pointing towards the tongue, in which case the temporary *molares* must be removed, that the *bicuspides* may rise into their proper situations.‡

* Plate XI. Fig. 3, 4. † Fig. 5. ‡ Fig. 6.

In the upper jaw the permanent central *incisores* sometimes pass through the gums behind the temporary ones; when this happens, the four temporary *incisores* must be extracted, and frequent pressure by the thumb should be applied to the new teeth, in order to bring them forward as soon as possible, and prevent one of the cases of irregularity most difficult to be remedied.

When the temporary central *incisores* have come out, the space is generally too narrow for the permanent ones, and hence they are pressed into some shape of distortion. Their edges do not assume the regular curve, but stand obliquely, or even sometimes one before the other. Cases of this kind require the removal of the temporary lateral *incisores.**

The permanent lateral *incisores* are very broad; they occupy the greater part of the space of the four temporary ones, and leave scarcely any room for the permanent lateral *incisores;* on which account these latter teeth must grow very irregularly; they generally pass through behind, being forced considerably backwards by the resistance of the central *incisores* and the temporary *cuspidati.* Sometimes they pass through edgeways, and now and then they project forwards. In any of these cases the removal of the temporary *cuspidati* is abso-

* Plate XI. Fig. 7.

lutely necessary, and unless the operation be timely performed, the irregularity is with difficulty remedied.*

The greatest deformity is generally occasioned by the want of room for the lateral *incisores* and the *cuspidati*, and when too long neglected usually becomes permanent.

When the permanent *cuspidati* make their appearance, they generally project very much forwards, and not only disfigure the mouth, but are very dangerous. I have known several instances, where, from the accident of a blow, the upper lip has been cut through. Whenever the *cuspidati* are growing thus, the first temporary *molares* ought to be extracted.†

When the *bicuspides* appear before the temporary *molares* have been extracted, they pierce the gums above the shedding teeth, and may be seen by raising the cheek and upper lip. The removal of the temporary *molares* immediately permits them to come down into their right situation.‡

In almost all the cases of irregularity which occur in the under jaw, nothing more is necessary after the removal of the obstructing tooth, than to apply the frequent pressure of

* Plate XI. Fig. 8, 9. † Fig. 10. ‡ Fig. 11.

the finger, in such a manner as to direct the irregular tooth into its proper place. It will assist the natural tendency of the teeth to form a regular circle, and to take up as large a space as possible. But in the upper jaw, when the irregularity has been suffered to remain for any length of time, it cannot be obviated without having recourse to other assistance.

Irregularity is often occasioned by the teeth being much too large for the space allotted them, and then it will be necessary to remove one or more of the permanent teeth.

When the *incisores* are perfectly regular, and the *bicuspides* have appeared before the *cuspidati*, there is so little space left, that the *cuspidati* are thrust too forward.*

It has been the common practice to admit the *cuspidati* to grow down to a certain length, and then to extract them. This operation certainly removes the deformity of projecting teeth, but it destroys the symmetry of the mouth, and takes away two teeth of great importance. The *cuspidati* are exceedingly strong; they form the support of the front of the mouth, and in the advanced periods of life, to those

* Plate XI. Fig. 12.

persons who have the misfortune to lose the *incisores*, they furnish an excellent means of fixing artificial teeth.

On these accounts they should be preserved, and therefore it will be right to extract the first *bicuspis* on each side. The *cuspidati* will then fall into the circle, and if there should be any vacant space, it will be so far back, that no defect will be perceived. This is often the case in the under jaw, as well as in the upper, and the same practice ought to be adopted.

The first permanent *molares* often become carious soon after they appear; when this is the case, and the other teeth have not proper room, considerable advantage always attends their extraction. Their removal permits the *bicuspides* to fall back, and gives way for the regular position of the *cuspidati*.

The removal of the Teeth when decayed ought always to be recommended, although they may not occasion pain, or there be no irregularity in the front teeth; diseased teeth always affect others, and therefore ought never to remain in the mouths of children.

If they be extracted before the second permanent *molares* appear, in a short time they will not be missed, because the *bicuspides* will go back, and the second and third *molares* will come forward, so that no space will be left.

The front teeth may even derive much benefit from this gain of room, as there will probably be left a small space between them, which will tend to their preservation; for it is observed, when teeth are situated so close as to press hard upon each other, they almost always fall into a state of decay.

Sometimes the upper jaw is too narrow from side to side, the teeth in the fore part are thrown forwards, and project very much over the teeth of the lower jaw: they also push out the upper lip. In this case the first *bicuspis* on each side should be extracted, which will permit the teeth to fall into a more regular curve.

When the permanent *incisores* of the upper jaw have cut the gum behind the temporary teeth, and have been suffered to remain until considerably advanced in growth, they al-

ways stand so much inwards, that when the mouth is shut, the *incisores* of the under jaw stand before them, which is always an obstacle to their acquiring regularity, and occasions a great deformity.

There are four states of this kind of irregularity. The first, when one central *incisor* is turned in, and the under teeth come before it, whilst the other central *incisor* keeps its proper place, standing before the under teeth.*

The second is, when both the central *incisores* are turned in, and go behind the under teeth; but the lateral *incisores* stand out before the under teeth.†

The third variety is, when the central *incisores* are placed properly, but the lateral *incisores* stand very much in; and when the mouth is shut, the under teeth project before them and keep them backward.‡

The fourth is, when all the *incisores* of the upper jaw are turned in, and those of the under jaw shut before them. This is sometimes occasioned by too great a length of the under jaw, in consequence of which it projects considerably forwarder

* Plate XII. Fig. 1. † Fig. 2. ‡ Fig. 3.

than the upper jaw.* But the majority of such cases originate entirely from neglect, and may be completely remedied by early assistance.

The time to effect any material alteration in the position of the teeth, is before thirteen or fourteen years of age, and as much earlier as possible; for after that time the sockets of the teeth acquire a great degree of strength, and the teeth are so fixed that they cannot be moved without much difficulty. If the irregularity be left to a much later period, it becomes a great deal more difficult to produce any alteration, and frequently all attempts are fruitless.

To remove the kind of irregularity above-mentioned, two objects must be accomplished; one, to apply a force which shall act constantly upon the irregular tooth, and bring it forward; the other, to remove that obstruction which the under teeth, by coming before the upper, always occasion.

The first of these objects may be attained by the application of an instrument adapted to the arch of the mouth, which, being attached to some strong teeth on each side, will furnish a fixed point in front, to which a ligature previously fastened

* Plate XII. Eig. 4.

on the irregular tooth may be applied, and thus, by occasionally renewing it, a constant pressure is preserved, and the tooth may be drawn forward.

The second object, that of removing the resistance of the under teeth, must be attained by placing some intervening substance between the teeth of the upper and under jaws, so as to prevent them from completely closing, and be an obstruction to the coming forwards of the irregular tooth.

The instrument may be made of gold or silver; it should be so strong as not easily to bend; if about the sixteenth of an inch in breadth, and of a proportionate thickness, it will be sufficiently firm. This bar of gold must be bent to the form of the mouth, and should be long enough to reach to the temporary *molares*, which are the teeth to which it is to be tied. Holes are to be drilled in it at those places where ligatures are required, which will be on the parts opposed to the teeth designed to be the fixed points, and also at the parts opposite to the place where the irregular tooth or teeth are situated. Then to the bar a small square piece of ivory is to be connected, by means of a little piece of gold, which may be fastened to the ivory and the bar by two rivets. This piece of ivory passes under the grinding surfaces of the upper

teeth, is kept there fixed, and prevents the teeth from closing, and consequently takes off all obstruction in front.*

The bar is to be attached by a strong silk ligature to the teeth a the sides, so that if possible, it may remain tight as long as it is required; a ligature is then to be tied around the irregular tooth, and the ends, being brought through the holes in the bar, are to be tied in a firm knot. In two or three days this ligature must be removed and a new one applied; the tooth will soon be perceived to move. A fresh ligature must be used every three or four days, in order to keep up a constant pressure, sufficiently powerful to bring the tooth into a line with the others.†

The same mode of treatment is to be observed whether there be one, two, or three teeth growing in a similar manner. The teeth are usually brought forwards in about a month or five weeks, and as soon as they are so much advanced as to allow the under teeth to pass on the inside, the piece of ivory may be removed, and the bar only be retained for a few days, until the teeth are perfectly firm, which will prevent the accident of the teeth again receding.

* Plate XII. Fig. 5. † Fig. 6, 7.

In cases where the irregularity has been suffered to continue too long, no success can be expected to follow attempts to remove it; we must content ourselves in the treatment of these cases in adults, with taking away the most irregular teeth, and thus, as much as possible, lessen the deformity.

CHAP. VIII.

Of Supernumerary Teeth.

The growth of more teeth than the natural number frequently occurs, and is always the cause of great irregularity of the teeth. It most commonly happens that supernumerary teeth are met with in the upper jaw, and they are chiefly placed in some part about the *incisores* and *cuspidati*. They are only rarely met with at the posterior part of the mouth, and then they resemble small *dentes sapientiæ*, being placed on one side or other of those teeth.

The form of supernumerary is very different from that of any of the other classes of teeth; they are generally small round teeth, resembling the point of a quill,* and sometimes they are not much unlike a broad *bicuspis* of the under jaw.†

* Plate XIII. Fig. 1. † Fig. 2.

When these teeth appear, they always create a considerable deformity; commonly there is only one of them, and that is placed either between the central *incisores*, or projecting over them, or between the central and the lateral *incisores*, or behind, turning towards the roof of the mouth.*

When there are two supernumerary teeth, the fore part of the mouth is so filled as to occasion the *incisores* and *cuspidati* to be placed in a double row. I have seen three remarkable instances of this kind: in one, there were two supernumerary teeth, of the conical kind, which were placed together, and had come behind and between the central *incisores*, which they had thrust forwards. The lateral *incisores* grew in a line even with the supernumerary teeth, behind the central *incisores* and *cuspidati*, and so formed a second row. This was the most conspicuous deformity of the teeth I ever saw, for the mouth could not be opened to speak, without completely presenting them to view.†

In the other two cases the supernumerary teeth resembled *bicuspides* of the lower jaw; they had large crowns, with depressions at their bases, and, by thrusting the other teeth into very improper situations, produced an appearance of a double row.‡

* Plate XIII. Fig. 4, 5. † Fig. 6. ‡ Fig. 7.

These supernumerary teeth should always be extracted as soon as they are perceived; and if they have occasioned the other teeth to turn out of their right direction, the application of a ligature will soon bring them again into their regular situation.

CHAP. IX.

Of the Decay of the Temporary Teeth.

The temporary teeth are very liable to become carious, and generally cause a great deal of pain. Sometimes this disposition to decay shews itself very early, and in two or three cases I have seen every tooth in a diseased state at so early a period as three years. The little patients are generally dreadfully afflicted, and by their rest being disturbed, and their being unable to masticate food with comfort, the health is often much impaired. These circumstances render the extraction of these decayed teeth highly necessary.

Sometimes abscesses of considerable extent form about the sockets and gums of these carious teeth, and produce

considerable mischief. I have seen the gums acquire a sloughy appearance, discharging a quantity of fetid matter; and sometimes so much injury is done as to occasion the death and exfoliation of portions of the jaw bones; when this happens it usually extends so far as to include the sockets containing the forming permanent teeth, which I have seen come away with the diseased temporary ones.*

On these accounts it should always be recommended, when a child's teeth have become carious, and occasion pain, gum boils, or abscesses, to extract them, as they not only very materially injure the health, but also are liable to prevent the formation of the permanent teeth.

* Plate XIII. Fig. 12.

CHAP. X.

Of the Diseases which attend Dentition.

THE period of dentition in children is generally considered as one of the most critical in life. In infancy the animal frame is so delicate, that the least local irritation produces a sudden and universal sympathy throughout the whole body. Hence the excitement occasioned by the passage of the teeth through the gums often gives rise to the most alarming constitutional symptoms, which are always with difficulty alleviated, and not unfrequently terminate in death.

The mode in which the teeth pass through the gums is very much misunderstood; the prevailing opinion is, that as the teeth advance in growth, they find their way through the gums by their own mechanical pressure. The idea has given rise to the common expression of cutting the teeth, and the pain during dentition has been considered as being produced by a laceration of the membrane and gum covering the tooth.

That this is an erroneous opinion will be perceived, when the state of the teeth and gums at that time is considered.—During its formation a tooth is loosely contained in the socket, and can exert no force sufficient to perforate so firm a substance as the gums. The gums also possess a certain degree of elasticity, and could by the gradual pressure of the rising teeth, be stretched so as to become elongated with the progress of the teeth, and would continue to cover them.

A passage for the teeth is opened by the process of ulceration. By the pressure of any extraneous substance upon a sound part, or by a diseased enlargement of some part within the body, an absorption of the parts subjected to the pressure will take place. This, in a very remarkable degree, is seen in cases of aneurism, in which, by the pressure of a soft tumour, bones of the most compact structure are removed by the process of absorption, and that unattended with any secretion of pus.

When the teeth have advanced so much in their formation as to be too long to be contained in the socket, under the gum, they press upon the membranes which enclose them; these become absorbed, and then the pressure being applied against the gum, that also is removed, and the teeth make

their appearance. When the absorption of the membrane and gum takes place early, the child suffers no inconvenience during the progress of dentition. The teeth advance without any trouble, and their appearance is discovered by the mother or nurse with some degree of surprise: but when the growth of the teeth is too rapid for the absorption of the gums, dentition is often attended with much pain and derangement of the whole system. At this early period of life, as I have already observed, the constitution is so delicate, and the irritability so great, that the least cause of irritation produces an universal sympathy throughout the whole system. It is well known to many adults, that the pain attending the protruding of the *dentes sapientiæ* is very great, and it therefore cannot excite surprise that this cause of irritation should in children produce so many distressing symptoms, and even be the cause of destroying so many.

When the formation of the tooth goes on very rapidly, and the absorption of the parts which cover it does not proceed in proportion, it becomes confined; this produces a distention of the membrane, and occasions pressure upon the pulp, nerves, and vessels at the bottom of the socket. The tooth continues to grow, and the increased pressure, which is

occasioned by this augmentation, produces inflammation, and a variety of symptoms of general irritation.

Few children obtain all their teeth without undergoing some degree of suffering: in many, the symptoms are merely local, in others they often arise to a very alarming height, and not unfrequently terminate fatally.

When the symptoms are merely local, the gums become very tender, and look redder than ordinary, the child is restless, and rather fretful: these symptoms with some children are of short duration, and always go off as soon as the tooth appears. Nature operates in a very salutary manner for their relief, by occasioning an increase in the secretion of the saliva, which generally is discharged in large quantities, and thus diminishes the action of vessels. In other cases a gentle diarrhœa takes place, which also reduces the state of irritability. They also find relief from rubbing or pressing the gums, which is best done by themselves. The coral, though used as a common appendage to a child's dress, is a very injurious and a very improper substance: children ought to have nothing hard; they will put their fingers into the mouth and bite upon

them; or they may have a soft crust of bread; this slight pressure will expedite the absorption of the gum, and consequently the passage of the tooth; while that produced by a harder substance will increase the irritation and inflammation.

When the constitution becomes affected, all the symptoms of general irritation occur, and there is scarcely any affection we do not meet with in one case or other of difficult dentition.

Fever is a frequent attendant, and it often comes on very suddenly: at first there is a heaviness about the eyes, the child then becomes hot, having the skin dry and tongue white; it gets very restless, putting the hand into the mouth, and can neither eat nor sleep. Sometimes these symptoms are so much aggravated that delirium will take place, and convulsions supervene.

In other children, the skin is more particularly affected; a little fever arises, which is soon followed by some kind of eruption. There are several appearances seen upon the skin during childhood, and which are the consequence of irritation during the time of dentition.

A very common eruption is a rash, which resembles the measles, and which appears in spots about the face and neck, sometimes extending over other parts of the body. This rash is like an aggregate of small pimples, so that when the finger is pressed over the red part, from the skin which is healthy, a small rising may be felt. This has been called the red gum, and is very common to children during the early months. It may in general be esteemed beneficial; for the blood being carried to the skin, takes off any improper determination to important parts, and prevents more serious disease.

Sometimes pustules arise in different parts of the body; they are at first transparent, from being filled with a limpid fluid, which afterwards becomes purulent, a scab forms, and the changes afford an appearance not unlike a mild small-pox.

There are other eruptions which form very unpleasant and extensive scabs; they break out upon the corners of the mouth, or on the cheek. Sometimes they begin upon the forehead, and spread over part of the scalp; they form large loose scabs, which drop off, but are soon succeeded by others. These scabs however, leave no scar, and

therefore are to be considered only as troublesome, and not dangerous.

Other children are subject to an inflammation, and a discharge from behind the ears; this may always be regarded as salutary, since from its contiguity to the teeth, it tends to divert the inflammation.

A gentle diarrhœa, during teething, is a beneficial effort of nature; it takes off the excitement from the constitution, and diminishes the febrile symptoms. But sometimes it becomes so excessive as to produce the most alarming symptoms; the discharges are of a green colour, very frequent, and attended with excessive griping; the rest is so much disturbed that no strength is gained by it; the child is continually starting, and spasms of various parts are occasionally seen; at length the whole system becomes so reduced that convulsions of the whole body take place, which continue until nature becomes completely exhausted.

In some children, the irritability of the nervous system is so great, that convulsions supervene in a very short time after the appearance of any febrile symptom, and this is constantly the case with the cutting of every tooth. Besides these dif-

ferent affections, there are so many other anomalous symptoms, that it may be truly said, that every symptom of general irritation which can be mentioned, may be met with during the time of dentition. In some children the lungs are much affected, and they are troubled with difficult breathing; in others, the continual derangement of health is often the cause of scrophula, rickets, or consumption. Mr. Hunter mentions a remarkable sympathetic affection in a child, which arose from the irritation excited by teething. Formerly children were often placed under most dangerous circumstances, when they happened to be attacked with the small-pox at the same time as they suffered from dentition; but happily now, they may be defended from that dreadful malady, by the shield which has been raised by the admirable discovery of Dr. Jenner; and we have the certain prospect, that this most horrible of human maladies is about to withdraw its pestilential influence from the world for ever.

In the treatment of any affection incident to children during the progress of dentition, if the teeth are at all suspected to be concerned, the removal of the cause of irritation ought to be first attended to. This must be done by opening the gum, so as to take off the confinement from the tooth, and

enable it to pass through. This operation ought always to be had recourse to in the first instance, and then other remedies should be applied according to the various symptoms which may appear.

When there is fever, the antiphlogistic regimen must be adopted. The bowels should be evacuated. The best medicine for children is calomel, which may be combined with rhubarb or scammony; or some of the neutral salts may be exhibited.

After these, saline draughts or gentle antimonials should be administered, in order to produce a determination to the skin. If the head should be much affected, a blister to the nape of the neck would be very useful. In all cases of rash, or eruptions, the child should be kept warm, and be particularly preserved from taking cold, as great danger often follows the sudden disappearance of any affection of the skin. If this should happen, the child should be put into the warm bath, and some medicines administered to produce diaphoresis; also attention is to be paid to the bowels, that no costiveness be suffered. In general, slight eruptions are to be regarded as beneficial, and particularly those occurring behind the ears, attended with moderate discharge. In cases of difficult dentition, when no sore ear has arisen spontane-

ously, much benefit has followed the practice of rubbing a small quantity of blister ointment behind the ears, and thus inducing a slight discharge.

If scabs are extensive and become dry and hard, they may be washed with warm milk and water, and touched with a little oil. They also may occasionally be wetted with the *hydrargyrus muriatus, in aqua calcis*, in the proportion of 1 gr. to 1 oz.: the scabs should never be picked off, but left to separate of themselves. When they extend over the head and are moist, much trouble and pain is occasioned by the sticking of the cap; they should then be dusted with a little powder, or some fine fuller's earth, and a singed rag should be laid over them. In these cases much good has been seen to attend the use of an oiled silk cap, or a piece of oiled silk laid over the part, this prevents evaporation, and the scabs do not dry and become so troublesome.

All eruptions are to be regarded as salutary, for so great a sympathetic connection exists between the skin and the stomach, that it often happens, that the repelling of any eruption from the skin, immediately produces considerable derangement of that organ, which ought to be regarded as a sort of centre of sympathetic action. This is very strikingly seen in

a variety of diseases in which the stomach sympathizes with the other parts of the body, and therefore during dentition it is of consequence not to check any mild eruption which may appear.

If a diarrhœa be only moderate, it should not be checked; it tends to diminish fever, and takes off the excitement from the constitution. As it is usually connected with acidity, a little magnesia, or some of the testaceous powders may be exhibited; but when the diarrhœa runs on for a great length of time, and seems to be causing weakness, which threatens fatal atrophy, serious endeavours must be made to subdue it.

The treatment of this complaint is attended with many difficulties, and medicines which succeed in some cases will totally fail in others. If the abdomen be much enlarged, two grains of calomel every night, purged off in the morning with ten grains of rhubarb and half the quantity of magnesia, will generally be found beneficial. This should not be persevered in more than three or four days successively, and should be succeeded by eight grains of the *pulvis cretæ comp. cum opio*, and four or five grains of columba root. The patient should be warmly clothed, especially on the abdomen and lower extremities. On some occasions the *pulv. trag. comp.* appears

preferable to the *pulv. cretæ comp.;* and the *syrup.* or *decoct. althæ*, with 20 drops of paregoric elixir, have succeeded when the other usual means have failed. The warm bath may be considered as another perfect species of warm clothing, and is attended with good effects, by relaxing the pores of the skin and relieving the bowels. If the above-mentioned remedies cannot be taken by the patient, opiate frictions of the abdomen or back should be used, and the following formula will answer very conveniently. *R. Ung. hydr. fort.* ʒ *i.* —*pulv. opii puri.* ∈ *i. olei oliv.* ʒ *iij. fiat linimentum bis terve in hebdomade infric;* but the quantity and repetition must be regulated by the judgment of the practitioner. If the patient is much distressed by tenesmus and stools streaked with blood, clysters of starch, with 20 drops of *tr. opii*, and twice that number of *tr. catechu* or *kino*, should be given every evening.

When convulsions have taken place, we must endeavour to remove what appears to be the exciting cause. If the stomach have been overloaded with improper food, or there be signs of indigestion, a gentle emetic should be given. If there is costiveness, or the bowels are affected, they should be cleansed by a clyster: when the stools are offensive, or the breathing at all affected, a few grains of calomel and scammony may be given with advantage. If those medicines do

not succeed, antispasmodics should be administered. It often happens that the deglutition is much affected, then it will be right to give an enema with asafœtida: or if not, in a draught, a drop or two of tinct. opii should be given. The back may be rubbed with oil of amber, or aqua ammoniæ. During the fit it is always proper to put the lower parts of the body into warm water, which by exciting a greater flow of blood to the legs, takes off too great a determination to the head; a blister should be applied to the back of the neck, and leeches may be applied to the temple.

Other symptoms which arise, must be met according to their urgency; but we ought never to lose sight of what may appear to be the principal exciting cause, viz. the inability of some teeth to pass through the gums.

Under every circumstance of indisposition, arising from dentition, the lancing of the gums ought never to be omitted. The benefit which attends the operation is so sudden, and if performed sufficiently early, is so certain, that it ought never to be neglected. As soon as the gum is lanced and the membrane is divided, the tooth obtains an increase of room, the pressure is immediately taken off from the socket, and the cause of irritation is removed.

It is very surprising that, notwithstanding the manifest advantage which attends the lancing of the gums, in cases of painful dentition, there are persons who entertain strange prejudices against this safe and important source of relief. But the uniform experience of its good effects, and no instance of its doing harm ever having occurred, should produce an unanimous consent for adopting it. Some persons object to the operation on account of the pain which it will occasion to the child, not considering that the inflammation produced by the resistance of the gum to the tooth, is far more acute than dividing the gum with a sharp instrument. Others suppose that the formation of the teeth is injured, and that they are more liable to decay; but neither of these circumstances can occur; for at the time that the teeth is about to pass through, the enamel is completely formed, and no injury can be done to the formation of the fang, which is always continued for some time after the appearance of the crown.

When it is necessary to lance the gums some time before the teeth are quite ready to appear, they unite, and in this case the cicatrix has been said to impede the progress of the tooth, presenting a greater resistance than the gums in their natural state; but it is now certainly known that a newly formed part always gives way sooner to the process of

absorption than the surrounding parts, and hence the passage of the tooth is facilitated.

The hæmorrhage which is occasioned by the operation is never considerable, but is always beneficial; the vessels become unloaded, and the inflammation is always soon diminished.

The most convenient instrument for this purpose is a round-edged gum lancet; this cuts much easier than a pointed one. It is necessary that the tooth be felt with the edge of the instrument, else the membrane may still be left upon the stretch, and no other benefit be derived than that which proceeds from the topical bleeding. In lancing the *incisores* it will be proper, in dividing the gum, to pass the lancet down on the anterior part of the tooth; for if it be carried deep on the posterior part of the tooth, there may be a danger of dividing the membrane which connects the pulps of the permanent teeth to those of the temporary, and the formation of the former may be injured.*

When the gums of the *molares* are to be lanced, a crucial incision may be made, or two semilunar incisions, the gums soon

* Plate IX. Fig. 5.

separate, and the tooth shortly makes its appearance. The symptoms which usually precede any indisposition arising from teething ought to be universally known, because then the certain remedy may be applied in time, and a great deal of suffering be spared to the child. If the nurse be attentive, she will find the child does not take the nipple with the same degree of force as ordinary, or it holds it only for a short time, and soon lets it go; the gums feel hot, and are redder than usual; the cheeks appear flushed, the eyes look heavy, and the child is uneasy. When these symptoms appear, the mouth should be examined, and if there be any fulness of the gums, or they have appearance of inflammation, they should be lanced at that part. The order in which the teeth appear should always be kept in mind, and then there will be little probability of mistake, as to the spot where the cause of irritation is seated.

As a child increases in strength, the symptoms arising from dentition diminish, and often become merely local; but the diseases to which infants are liable, frequently keep them in weak health, and much disposed to be affected by any exciting cause of irritation.

To delicate children there is often danger, attending the cutting of the *cuspidati* and the first *molares.* These teeth advance in growth nearly at the same time, so that there are eight teeth making pressure upon the membranes and the gums at the same period. If at this time a child should be at all indisposed, one or other of these teeth may be the cause of convulsions, or some other serious disease; therefore, when any of these teeth appear to be in a state of forwardness, the gum should be lanced. This is the only method of treatment to be relied on to bring a weakly child through this period.

During the second dentition, with one exception, scarcely any pain is felt; the constitution has acquired such a degree of strength that the sympathetic action is with more difficulty excited, and the only inconvenience ever experienced is, when the permanent teeth, which are placed at the base of the temporary ones, by the increase of their growth make pressure against them; this more particularly happens when the *bicuspides* are endeavouring to come forward, and being resisted, by the continuance of the temporary *molares,* a tenderness and pain are occasioned, which can only be relieved by extracting the temporary teeth, and thus giving way for the passage of the permanent.

The exception to which I have alluded with respect to pain during the second dentition, is in the *dentes sapientiæ;* very often a great deal of pain attends the progress of these teeth. When there is scarcely sufficient space for them to grow, or the gum being very thick is firmly bound over them, considerable inflammation, and sometimes swelling of the face takes place. In many cases the pain is so severe as to excite a considerable degree of fever and indisposition. I have known persons confined from this cause only, during several weeks. If the *dentes sapientiæ* of the upper jaw pass through first, it very much increases the inflammation, because whenever the mouth is closed, the gums which cover the teeth in the under jaw are bitten upon by the upper, and being continually pinched, the patient suffers extremely.

Generally it is only necessary to lance the gums with a crucial incision; there is often a good deal of hemorrhage, which is very useful in reducing the inflammation; the gum soon retracts, and the tooth gradually passes through. When the upper *dentes sapientiæ* appear first, it is sometimes necessary to cut off the piece of gum which covers the under tooth.

In many cases the gum is very thick, and will often close and unite again after the operation; this produces a necessity for repeating it; but which might always be prevented, by inserting a small piece of lint between the edges of the divided gum, which then cannot unite; they remain separated, and gradually receding, the tooth has no longer any obstruction.

Sometimes, in these cases the gum is exceedingly swelled over the tooth, and when divided by the lancet, a considerable quantity of glairy fluid escapes; in some instances I have met with considerable quantity of matter, and in one case the gum was ulcerated to a great extent.

CHAP. XI.

BEING desirous to render this work as complete as possible, I requested the favour of my friend, Mr. Pepys, to make a chemical analysis of the teeth, and from the accuracy with which all his experiments are conducted, I flatter myself that the following observations will not a little enhance the value of the publication.

THE ANALYSIS OF HUMAN TEETH.

BY W. H. PEPYS, JUN.

Mr. Charles Hatchet, in his valuable paper on shell and bone, [Phil. Transact. for 1799] enumerated the several substances which enter into the composition of the human teeth; it is to be regretted that the nature of his subject did not render it necessary for him to ascertain the proportions in which they are respectively found, as it could not have failed to have proved highly useful, and his known accuracy would have precluded the necessity of any other person undertaking such

a labour. Several good analyses of bone have been published, but I believe no accurate analysis of the teeth has yet been offered.

Bone, it has been observed, when exposed to the action of acid menstrua, becomes dissolved; that is to say, the solid or constituent substance of them is abstracted, and a gelatinous matter is left of the form of the original bone.

Nitric, muriatic, and acetic acids are capable of producing this change, which is accompanied with a liberation of an aeriform fluid, that precipitates lime in lime water, changes vegetable blues red, and by its gravity is known to be carbonic acid gas. These acid solutions yield a copious precipitate with pure ammonia, which is again soluble in either of the acids. After the precipitation by pure ammonia, the solution of the carbonate of ammonia will still produce a new precipitate.

The precipitate of the first solution, by pure ammonia, as noticed above, is soluble again in the acids before mentioned; these solutions yield, with a solution of acetite of lead, a copious precipitate, proving the presence of phosphoric acid.

The precipitate obtained by the carbonate of ammonia is also soluble in either of the above acids, but with effervescence; and these solutions are not precipitated by acetite of lead; they fall, however, with oxalate of ammonia, carbonate of ammonia, or any precipitant of lime.

The great solubility of the phosphate of lime, in even the weakest of the acids, is very extraordinary. Phosphate of lime mechanically suspended in water, is speedily and completely dissolved by passing a copious stream of carbonic acid gas through it.

With these facts before me, I have ventured to examine the several specimens of the human teeth; as the enamel, the bone, or roots, the teeth of adults, and the shedding teeth of children.

Previous to an account of the analysis, it may not be uninteresting to notice the action of some of the articles of the *materia chemica* on the teeth.

Sulphuric acid, of the specific gravity 1.83, appears at first to have no action; in the course of an hour small bubbles are perceived, the roots become blackened, and in twelve

hours the enamelled part bursts, cracks, and separates, accompanied with an evident formation of selenite, by the action of the acid on the lime, which enters into the composition of the teeth.

Nitric and muriatic acids of the specific gravity of 1.12, act instantly on the tooth, accompanied with an evolution of a quantity of small air bubbles from the whole of the surface; about eight times their weight of these acids are sufficient for the solution of the solidifying principles of the teeth. The mass left undissolved has nearly the original form of the tooth, is flexible, semitransparent, and easily divided by the nail.

The dilute acetous acid (distilled vinegar) has a very trifling action, but when concentrated, acts both on the phosphate and carbonate of lime.

Boiling nitric acid acts strongly on a tooth, with the evolution of carbonic acid, and a considerable quantity of azotic gas. The gelatine and solid substance are dissolved as the surfaces present themselves; but the operation being stopped at any part of the process, the residuum is firm and hard,

but reduced in size proportioned to the time the tooth has been acted upon.

ANALYSIS OF THE ENAMEL.

One hundred grains of the enamel of human teeth, (carefully rasped) were placed in 600 grains of nitric acid of the specific gravity 1.12. Slight effervescence ensued, and after twelve hours 200 grains more of the acid were added. Allowing for the loss by evaporation in a corresponding vessel, after thirty-six hours it was found to have lost four grains and a half.

It was then diluted with four ounces of distilled water, precipitated by pure ammonia, and then filtered.

The precipitate obtained being dried in a water bath, at 212°, weighed 102 grains. It was then ignited, after which it was found to weigh 78 grains.

The filtered solution was then precipitated by carbonate of ammonia in solution, and filtered:

The separated precipitate being dried in a heat of 212°, weighed six grains. Enamel then consists of

Phosphate of lime - -	78
Carbonate of lime - -	6
	84
Water of composition and loss -	16
	100

A loss of 16 grains here takes place, which is easily accounted for, from the impossibility of directly ascertaining the state of dryness in which the ingredients existed originally in the enamel; for we have seen, that by drying the phosphate of lime in a heat of 212°, (after which it had the appearance of being as dry as possible) it yet contained so much moisture, as to yield a gain of 8 grains in the analysis.

On the other hand, when ignited, its state is driven to the opposite extreme, and there is a loss of 16 grains. It is impossible, however, that the materials could exist in the teeth, in a state of dryness to be compared with that produced by exposing them to such a high temperature. And it appears but reasonable to conclude, that the real quantity of moisture lies nearer to that given by the heat of 212°, than to that given by ignition, and consequently that the 16 grains lost by exposure to such a high temperature, were chiefly water.

Bone, or roots of teeth, yielded by analysis in 100 grains,

Phosphate of lime - -	58
Carbonate of lime - -	4
Gelatine - - -	28
	90
Water of composition and loss -	10
	100

The teeth of adults yielded on analysis in 100 grains,

Phosphate of lime - -	64
Carbonate of lime - -	6
Gelatine - - -	20
	90
Water of composition and loss -	10
	100

Specific gravity of adults' teeth - 2.2727.

The shedding, or primary teeth of children, yielded on analysis in 100 grains,

Phosphate of lime - -	62
Carbonate of lime - -	6
Gelatine - - -	20
	88
Water of composition and loss -	12
	100

Specific gravity of children's teeth 2.0833.

In these analyses, as in the former, the phosphate of lime was also exposed to a red heat, and consequently was reduced to a greater degree of dryness than that in which it existed in the tooth.

In all of them the carbonate of lime was dried in a heat of 212° (above which it would have been liable to decomposition) and the gelatine of the three last in the same temperature.

FINIS.

EXPLANATION

OF THE

PLATES.

PLATE I.

The rudiments of the alveolar processes, and the pulps of the teeth.

Fig. 1. The under jaw of a fœtus at three or four months. In the anterior part, processes of bone are shooting across to form the alveoli for the incisores.

Fig. 2. The gums removed from the same jaw bone, exhibiting the first appearance of the pulps, those of the incisores being the most distinct.

Fig. 3. The under jaw of a fœtus at six months, in which the alveolar processes are seen more advanced.

Fig. 4. The pulps removed from the same jaw, distinctly formed, each contained within its proper membrane.

Fig. 5, 6. The upper jaws of fœtuses of the same age, as in Fig. 1, 2; exhibiting the alveolar processes and pulps.

PLATE II.

THE progress in the formation of the teeth from the time of birth, until between two and three years of age.

*** The figures on the left side of the plate represent the teeth as naturally situated; those on the right side as taken out from the sockets; the dotted lines represent the gums.

FIG. 1. The teeth at the time of birth, when they are only shells, having the form of the crowns of teeth.

a. The central incisores.
b. The lateral incisores.
c. The cuspidati.
d. The first molares.
e. The second molares.

A. Points of ossification upon the tips of the pulps of the permanent incisores.

B. Points of ossification upon the points of the permanent molares.

FIG. 2. The teeth of a child about six or eight months after birth. At this time the central incisores of the upper jaw, and the central and lateral incisores of the lower jaw, have made their appearance; the other teeth are considerably advanced in growth.

a. b. c. d. e. The temporary teeth.
A. The permanent central incisores.
B. The permanent lateral incisores.
C. The permanent cuspidatus of the lower jaw.
D. The first permanent molares.

FIG. 3. The teeth of a child at sixteen months. The incisores in each jaw, and the first molares have passed through the gums.

A. The permanent incisores much increased.
B. The cuspidati.
C. The first permanent molares.

FIG. 4. The temporary set of teeth have all passed through the gums, and in addition to the permanent teeth already described are,

A. A. The points of the first bicuspides.

PLATE III.*

The teeth of a child between four and five years of age.

Fig. 1. A side view. Fig. 2. A front view.

a a a a.	The central incisores.	Of the temporary set.
b b b b.	The lateral incisores.	
c c c c.	The cuspidati.	
d d d d.	The molares.	
e e e e.	The central incisores.	Of the permanent set.
f f f f.	The lateral incisores.	
g g g g.	The cuspidati.	
h h h h.	The first bicuspides.	
i i i i.	The first molares.	
k k.	The second molares.	

The formation of the second bicuspides has not yet commenced.

* For the references to this Plate, and Plates IV. and V. see the outline Plate VI.

PLATE IV.

THE two sets of teeth at six years of age.

FIG. 3. of Plate VI.

a a a a.	The central incisores.	Of the temporary set.
b b b b.	The lateral incisores.	
c c c c.	The cuspidati.	
d d d d.	The molares.	
e e c e.	The central incisores.	Of the permanent set.
f f.	The lateral incisores.	
g g g g.	The cuspidati.	
h h h h.	The first and second bicuspides	
i i.	The first molares.	
k k.	The second molares.	

PLATE V.

The teeth at eight or nine years of age. The incisores have been changed, and the first permanent molares have appeared.

Fig. 4. of Plate VI.

a a.	The cuspidati.	Of the temporary set.
b b b b.	The molares.	
c c c c.	The central incisores.	Of the permanent set.
d d d d.	The lateral incisores.	
e e.	The cuspidati.	
f f f f.	The bicuspides.	
g g.	The first molares.	
h h.	The second molares.	
i i.	The third molares, or *dentes sapientiæ*, beginning to form.	

PLATE VII.

Fig. 1. The permanent set of teeth complete.
Row 1. The temporary teeth of the upper jaw.
Row 2. The permanent teeth of the upper jaw.
Row 3. The permanent teeth of the lower jaw.
Row 4. The temporary teeth of the lower jaw.

PLATE VIII.

FIG. 1. Longitudinal sections of teeth, the bony part of which has been burnt, to render the distribution of the enamel more conspicuous.

FIG. 2. The transverse section of a molaris.

FIG. 3. A tooth magnified, to exhibit the striated appearance of the enamel.

FIG. 4. An under jaw, the fore part of which, and of the teeth, have been sawn away to shew the cavities in the teeth.

FIG. 5. A section of the under jaw; the nerve is seen, giving off branches which enter the cavities of the teeth.

FIG. 6. A molaris of the under jaw, having three fangs.

FIG. 7. A molaris having on its side a deposit of enamel like a pearl.

FIG. 8. The central incisores of the under jaw united at the sides.

FIG. 9. Two views of the second and third molares of the upper jaw, which are united by the inner fangs.

FIG. 10. A molaris of the under jaw, having the crown of a bicuspis growing out of its side.

FIG. 11. A molaris of the under jaw, having four fangs.

FIG. 12. The permanent central incisores of the under jaw, having an exceedingly deformed appearance.

FIG. 13. A molaris of the upper jaw, having five fangs.

FIG. 14. Several teeth, shewing the appearance of the enamel when defective in quantity, the surface of the teeth being covered with small indentations.

PLATE IX.

All the figures of this plate are from injected preparations.

FIG. 1. The under jaw of a child at the time of birth; the fore part has been removed, and the membranes inclosing the teeth are seen to be vascular.

FIG. 2. The teeth have been turned out of the sockets, and the inner membranes are also seen to be vascular.

FIG. 3. The lower jaw of a fœtal calf, in which the vascularity of both membranes is seen. The membrane belonging to one tooth has been turned down to exhibit the vascularity on the inner side.

FIG. 4. Half of the upper jaw of a boy about eight years of age. Part of the central incisor, the cuspidatus, the first molaris and the second molaris, (not yet completely formed) has been cut away to show the vascularity of the membrane within the cavities of the teeth. The lateral incisor and the bicuspides are contained within the membranes.

FIGURES 5, 6, 7, 8, and 9, represent the manner in which permanent teeth are formed.

FIG. 5. Half the under jaw of a child soon after birth. The membranes of the teeth are seen, and over the bristle the membranes of the pulps of the incisores and the cuspidatus of the permanent set, which are firmly attached to the membranes of the temporary teeth.

FIG. 6. Part of the jaw of a child about three years of age. The permanent teeth are placed deep in the jaw, and their membranes remain attached to the gums. The vessels of the membranes are derived from the gums. The artery which passes through the jaw sends off branches to the pulps of the teeth.

FIG. 7. Teeth which have been removed from the sockets to explain the attachment of the permanent to the temporary teeth.

a. The pulp of the temporary teeth inclosed within its membrane.
b. The pulp of the permanent teeth attached by its membrane to that of the temporary.
c. The temporary tooth completely grown.
d. The permanent tooth attached to the gum, the membrane being elongated into a sort of pedicle.

FIG. 8. A section of the lower jaw, showing the temporary tooth, with the manner of the situation and attachment of the permanent tooth.

FIG. 9. Exhibits the manner in which the pulps of the permanent molares are produced.

a. The first permanent molaris inclosed in its membrane.
b. A small membranous substance given off from the membrane of the first, and which becomes the pulp of the second permanent molaris.

FIG. 10. Half of a young jaw, showing the foramina through which the membranes of the permanent teeth pass, to be attached to the gums. A bristle is placed in one, and is seen going into the socket of the new tooth.

PLATE X.

Fig. 1. The progress of absorption in several of the temporary cuspidati.

Fig. 2. The same circumstance exemplified in several of the temporary molares.

Fig. 3 & 4. Sections of the lower jaw exhibiting the progress in the formation of the permanent teeth, and the absorption of the fangs of the temporary teeth.

Fig. 5. Exemplifies the changes which take place in the teeth at different periods.

A. Part of the under jaw of a child at six years, when the temporary teeth only are visible.

B. Part of the jaw of a child about eight or nine years of age. The temporary incisores and cuspidatus have been removed; the permanent incisores and the first permanent molaris have grown up.

C. In this jaw the first temporary molaris has been removed, and is succeeded by the first bicuspis; the cuspidatus and the second permanent molaris are appearing.

D. Part of a jaw in the adult state. The second temporary molaris has been succeeded by the second bicuspis. The third molaris, or *dens sapientæ,* has made its appearance. In this series of jaws, the change of the temporary teeth for the permanent, and the addition of the permanent molares are clearly elucidated. The teeth which succeed the temporary incisores and cuspidati are larger, and those which succeed the temporary molares are smaller.

Fig. 6. The upper jaw of a fœtus, in which only one incisor had formed.

a. The incisor.

b b. The cuspidati.

c c. The first molares.

PLATE XI.

Examples of irregularity sometimes occurring during the second dentition.

Those permanent teeth which are acquiring an irregular position, are sufficiently obvious. Those marked a a, are the temporary teeth which ought to be extracted.

PLATE XII.

FIG. 1. One central incisor turned in, being placed, when the mouth is closed, behind the under teeth.

a a. The temporary lateral incisores.

FIG. 2. The same circumstance occurring in both the central incisores. The lateral incisores being placed properly.

a a. The temporary cuspidati.

FIG. 3. The central permanent incisores rightly situated, the lateral ones turned in.

a a. The temporary cuspidati.

FIG. 4. The four permanent incisores, having the same improper situation.

FIG. 5. The bar to be fixed on the teeth, in order to remedy this kind of irregularity.

FIG. 6. Represents the bar as fixed in order to bring one of the central incisores forward.

FIG, 7. The bar fixed, with ligatures applied to the four permanent incisores, which are to be drawn forward.

PLATE XIII.

Cases of irregularity from supernumery teeth, &c.

FIG. 1. Supernumerary teeth of the conical form.
FIG. 2. Supernumerary teeth resembling bicuspides.
FIG. 3. A tooth which acquired a distorted shape during its formation, from the resistance of the temporary tooth.
FIG. 4. A supernumerary tooth placed between the central incisores.
FIG. 5. A supernumerary tooth growing above the central and the lateral incisor.
FIG. 6. A remarkable case of irregularity, occasioned by the growth of two supernumerary teeth.
FIG. 7. A similar case, the supernumerary resembled bicuspides of the lower jaw.
FIG. 8. A case of two lateral incisores on the same side.

Irregularity at an advanced period.

FIG. 9. a a. The lateral permanent incisores to be extracted.
FIG. 10. The most irregular tooth must be removed, when the others will approximate.
FIG. 11. A cuspidatus (a) left projecting until a late period; this being removed, the teeth will appear regular, as the lateral incisor and the first bicuspis are close to each other.
FIG. 12. An exfoliation from the upper jaw, containing the temporary molares, and (a a.) the bicuspides advancing in formation. b. The socket for the permanent cuspidatus.

PART II.

CONTAINING

THE

HISTORY AND TREATMENT

OF THE

DISEASES OF THE TEETH,

THE GUMS,

AND THE ALVEOLAR PROCESSES,

WITH THE OPERATIONS WHICH THEY RESPECTIVELY REQUIRE.

To which are added

Observations on other Diseases of the Mouth,

And on the Mode of Fixing

ARTIFICIAL TEETH.

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INTRODUCTION.

In the former part, I endeavoured to prove that the teeth are organized in a similar manner to other bones, and that, as possessing life, they are connected with, and form an integral part of, the system.

I have now the satisfaction to find that the same opinion is entertained by almost all the enlightened members of the surgical profession.

Mr. Hunter, who made many experiments, by feeding animals with madder, in order to ascertain the effect it would produce in colouring the different bones of the body, having observed that the teeth did not become tinged so speedily as the other bones, or, when tinged, that they retained their colour longer, hence concluded, that "they are to be considered as

extraneous bodies, with respect to a circulation through their substance."

The consequence of having formed this opinion was, that he could not, in any satisfactory manner, assign a cause for the different diseases of the teeth. It must, however, appear extraordinary that Mr. Hunter, who was so accurate an observer of the phenomena of nature, should have published this opinion, when he immediately added, that "they (the teeth) have most certainly a living principle, by which means they make part of the body, and are capable of uniting with any part of a living body."

The diseases which affect the mouth, and which are commonly considered as cases on which the surgeon-dentist is to be consulted, arise from affections of the teeth, the gums, and the alveolar processes.

The teeth are the organs of mastication; they are placed in sockets called *alveoli*, which are formed upon and make a part of the jaw bones, and are there firmly held by a periosteum, which lines the socket, and is also reflected over the fangs of the teeth. The alveolar processes are covered with a continuation of the gums, which are firm, but very vascular substances.

These parts have such an intimate connection with each other, that, when diseases originate in one, the others always become more or less affected. It is therefore absolutely necessary that an accurate knowledge should be had of all the diseases of those parts connected with the teeth; for, as the loss of the teeth is the ultimate consequence of disease in any of the contiguous parts, we can only expect to preserve instruments, so important to our comfort and welfare, by speedily applying such remedies as will restore the parts with which they are connected to healthy action.

The diseases to which the teeth are subject are similar to those which affect bones in general, and in like manner they have their origin in inflammation. The teeth differ only from bones in not possessing sufficient living power to effect the process of exfoliation.

These different kinds of diseases affect various parts of the teeth. A death of any part of the crown of a tooth constitutes *caries.*

The fangs are occasionally enlarged, as in *exostosis.*

The membrane contained within the cavity of a tooth some-

times inflames and suppurates, and the matter, being discharged at the extremity of the fang, causes that part of the tooth to acquire an appearance of a bone affected with *spina ventosa.*

A death of the fangs of the teeth often takes place, and presents a disease resembling that which in bones is called *necrosis.*

Besides these diseases, there are changes produced by a removal of the enamel from the bone of the tooth, called, by Mr. Hunter, decay by denudation. Also very disagreeable and painful affections resulting from accidents, such as fractures or luxations of teeth.

The gums are subject to several diseases peculiar to themselves, and to others which proceed from those of the teeth, or alveolar processes, beside other affections, which may be considered as the index of constitutional derangement.

The alveoli of the teeth have also their distinct diseases, as well as others in common with the teeth and gums, and are liable to be affected by diseases of the constitution.

In addition to these various diseased actions, there is an earthy deposit, called tartar, which, in a greater or less degree,

accumulates about the teeth of most persons; this, if suffered to increase to any quantity, causes a separation of the gums from the necks of the teeth, and a consequent absorption of the alveolar processes.

There are also diseases requiring surgical aid to which the *antrum maxillare* is liable; and different imperfections of the palate or roof of the mouth, arising either from natural malformation, or the consequence of disease. When these have been considered, the mode of supplying the loss of teeth, by means of artificial ones, will be described: and the work concluded with an account of the method of performing the several operations which the diseases of the teeth require.

OF THE DISEASES OF THE TEETH.

OF CARIES.

Caries, or, as it is commonly called, decay, is the disease with which the teeth are most frequently affected. At first it has its origin in the bony part of the crown of the tooth, the structure of which is gradually destroyed, and the disease proceeds until the whole of the crown of the tooth, both enamel and bone, is entirely removed.

When caries has made some progress internally, a small, opaque spot appears upon the enamel, where it covers that part of the tooth which is diseased, and the bony part of the tooth situated underneath this spot will be found of a dark brown colour: when the decay has advanced so far as to destroy the texture of part of the bone of the tooth, the enamel loses its support, then breaks away, and a cavity is discovered in the tooth.* Thus it is that in the first instance, caries originates; and

* Plate 1. fig. 1, 2.

it is by no means uncommon for a person, in a very short space of time, to discover cavities in several teeth, which had been supposed perfectly sound. In the mastication of hard substances, pieces of the enamel are broken off, on account of the texture of the bony part being destroyed by the caries, which had previously gone on internally.

There is no one part of a tooth more particularly liable to become diseased than another. In some, the caries appears in the irregularities of the grinding surfaces of the molares, and resembles a crack filled with a black substance, which at length breaks into a cavity in the centre of the tooth ; in others, it commences in the side of the tooth next the cheek ; and sometimes at the neck of the tooth, the decay extending into the body of the tooth underneath the enamel.

The decay very often commences on those sides of the teeth which are placed in apposition to each other ; this is the worst possible situation for the disease, because it often makes considerable progress without being discovered, and is much less conveniently placed for the performance of an operation to arrest its progress.

In the incisors, the caries most commonly begins at the sides,

between the teeth ; in some, it appears near the neck, the cavity extending across the tooth, and the disease proceeds until the tooth is nearly divided in two; in this case, whilst biting something hard, the lower part of the tooth usually breaks off, leaving the fang in the socket, and a small portion of the body of the tooth.

The molares are more subject to this disease than any of the other teeth : the incisors of the upper jaw are very frequently affected by it, whilst the incisors of the lower jaw very seldom become decayed.

When a decayed tooth is examined, the carious part appears to be disposed in strata, the external is the most decayed, is black, and so soft that it may be easily picked away. The next stratum will be found of a harder texture, and not so black in colour, and as the substance of the tooth is less decayed it becomes more dense, until we arrive at the sound part. Whenever a decay has taken place in a tooth, and the enamel, by becoming opaque, begins to exhibit the appearances of this disease as having gone on underneath, if the tooth be sawn through, a brown mark will be found extending into the natural cavity of the tooth : it is in this direction the decay always proceeds, and, when the cavity is exposed, the membrane which

lines it, and upon which the nerve and the blood vessels ramify, most commonly becomes inflamed, and causes pain.

During the progress of caries in a tooth, it is the internal part of the crown which is the soonest removed, causing the tooth to appear as if the inside had been scooped out. The enamel, being much harder than the bone, remains, and only breaks away as it loses its support, from the bony part becoming dissolved and removed.*

The progress of caries seems to be retarded when it has destroyed the whole crown of a tooth; for, although the decay may have gone on in the body of the tooth with great rapidity, yet the fangs will often remain for many years with scarcely any alteration, and they often continue for a considerable length of time firmly attached to the socket, without occasioning any inconvenience. Persons rarely experience the tooth-ache, properly so called, from stumps; for, when the caries has destroyed the whole of the body of the tooth, the membrane which lines the cavity is also removed, and the blood vessels and nerves, which pass through the canal in the fangs, generally likewise perish; on which account, whenever pain proceeds from decayed stumps, it usually is the consequence of inflammation taking place in the

* Plate I. fig. 4, 5.

sockets, whereby the attachment of the periosteum is destroyed, and the stump becomes an extraneous body, causing great inflammation in the socket and the gums, which often terminates in suppuration.

It very frequently happens, when a tooth has become so decayed as to leave only the stumps, that nature, as if conscious they were no longer useful, makes an effort to thrust them out; the socket gradually closes at the bottom, and thus the stumps are protruded, until they only adhere to the gum, thus they become loose, and occasion soreness and slight inflammation. The attachment being very weak, they are with great ease taken away.*

The cause of caries has not been satisfactorily explained, from the structure of the teeth not having been duly considered. Mr. Hunter says, "It does not arise from external iujury, or from menstrua, which have a power of dissolving part of a tooth; but we may reasonably suppose that it is a disease arising originally in the tooth itself." It is surprising that, although Mr. Hunter went thus far, he gave no correct idea of the manner in which the disease can alone originate.

* Plate I. fig. 6 *a*.

The proximate cause of caries appears to be an inflammation in the bone of the crown of the tooth, which, on account of its peculiar structure, terminates in mortification.

The membrane which is contained within the cavity of a tooth is very vascular, and possesses a high degree of nervous sensibility: an inflammation of this membrane is liable to be occasioned by any excitement which produces irregular action; and as the bone of the tooth is very dense, and possesses little living power, a death of some part of it may speedily follow an inflammation of the vessels of the membrane which are contained within the cavity.*

* Some time ago, I was applied to by a gentlemen, who complained of an acute pain arising from one of the molares of the under jaw: as I could discover no appearance of caries in it, I advised the loss of blood from the gums, with a view to remove the inflammation in the socket, or other parts connected with the tooth. This treatment was by no means effectual, for the pain continued with scarcely any intermission: the gentleman therefore determined to have the tooth extracted. In attempting this operation, the tooth broke off at the neck, and completely exposed the internal cavity. Fortunately, this accident proved to be satisfactory, as it afforded an opportunity of ascertaining the cause of the pain. The membrane lining the cavity of the tooth had become so highly inflamed, that it had proceeded to suppuration, and the cavity of the tooth was filled with pus. Immediately after the operation, the gentleman was perfectly relieved, and had no return of pain. In a similar case, instead of extracting the tooth, I should recommend the drilling a hole, at the neck of the tooth, into the cavity, in order to make an opening by which the matter might escape.

If a sound tooth, that has been recently extracted, be broken, the membrane will be found to be firmly attached to the bone of the tooth, forming the inner cavity. But when this membrane becomes inflamed, it separates from the bone, and the death of the tooth is the consequence.

That this is the proximate cause of caries, appears to be highly probable, by remarking that a caries of other bones is caused by a separation of those membranes which cover them, and which are attached to them. Thus a separation of the *periosteum* will cause a death of part of the tibia, or that of the *pericranium*, a caries of some part of the bones of the head.

This opinion is also confirmed by comparing the symptoms which accompany inflammation in a bone with those which are occasionally felt by persons in their teeth, previously to any appearance of caries.

During the inflammation of a bone, there is an obtuse, rather than an acute pain; the parts which surround or cover it feel sore, and cannot bear pressure; and, when there is the opportunity of making the comparison, an inflamed bone is found to have a darker appearance than a healthy one.

Very similar to these are the symptoms which are observed by every one when their teeth have been affected by what is commonly termed a cold. At this time a dull, uneasy pain is felt extending along the jaw, the teeth are tender, and cannot be pressed together with the ordinary degree of force; and it may almost always be observed, that the teeth thus affected have a darker appearance than those which are perfectly free from pain.

When these inflammatory symptoms subside, the pain in the teeth goes off; but, as inflammation may have caused a death of some part of one or more teeth, the decomposition of the internal part of the tooth goes on, until the enamel is broken away, and a caries is discovered.

I could mention many cases in corroboration of this statement, and produce several examples of teeth with the decay extending through the internal part, whilst the enamel remained perfectly sound.

In Plate I. fig. 4 *a*, is the representation of a tooth which I extracted for a lady, who complained of having suffered great pain from it for a length of time; the tooth appeared to be per-

fectly sound, but, on sawing it asunder, a considerable caries was discovered in the centre.

Fig. 5 *a* represents the perfect enamel of a tooth that separated from the bony part, which, by caries, had become quite soft and black.

Fig. 3 *a* shows the dark line which may be seen passing through the bone of a tooth from the external part to the cavity, in the centre, as described in page 9.

The chief predisposition to this disease consists in a defective formation of either the enamel or the bony part of the teeth.

The teeth of many persons are formed with a less quantity of earthy matter than of animal substance, on which account they do not acquire such a density as is necessary to make them durable, and resist those various causes of decay to which the teeth are constantly exposed. Teeth thus formed are at first very white, and have a certain transparency ; but they soon begin to decay, and frequently, in a very few years, the disease extends through the greater part of them.

Sometimes the enamel does not acquire a proper degree of

hardness, its attraction of cohesion being defective, in which case it has a dead yellowish tinge, and is of a chalky consistence.

When either of the above states of formation of the teeth occur, they very soon fall into a state of disease; because the enamel is not sufficiently dense to resist the force applied to the teeth, in the mastication of hard substances, without being broken; and the bone is of too soft a texture to continue long without being affected by some cause of inflammation.

This original defect in the structure of the teeth must depend upon a want of healthy action in the pulps, during the time of the formation of the teeth. It is impossible to conjecture what can be the cause of this imperfection, but it is very singular, and also very certain, that the same kind of structure may be observed in the teeth of many individuals in the same family, who, in all other respects, are very healthy.

That the teeth acquire this disposition to decay from some want of healthy action, during their formation, seems to be proved by the common observation, that they become decayed in pairs; that is, those teeth which are formed at the same time being in a similar state of imperfection, have not the power to resist the causes of disease, and, therefore, nearly about the same

period, they exhibit signs of decay, while those teeth which have been formed at another time, when a more healthy action has existed, have remained perfectly sound to the end of life.

Decay of the teeth is often the consequence of certain states of the constitution, in which the functions of the body are performed irregularly, inducing various dyspeptic symptoms.

In these cases, the caries affects many teeth at the same time, and often proceeds so quickly as, in a short period, to destroy the crowns of the teeth, leaving only the fangs.

It is remarkable that the caries, arising from these constitutional affections, has often a whitish appearance, and the bone of the tooth is then much softer than when it proceeds from simple inflammation.

I have also often had occasion to observe that great changes take place in the economy of the teeth, in consequence of continued fever: however sound the teeth of such persons may have been, previously to the disease, they have shortly afterwards discovered marks of caries, by which, in a few years, many of the teeth have been injured or destroyed.

Caries has been very commonly attributed to the use of certain articles of diet, and animal food has been supposed very much to contribute to this disease. In support of this opinion, it is observed that persons in the country, who live on plain fare, and those of Indian nations, who live on vegetable food, have their teeth perfectly sound and free from disease. That these persons are very often found to possess perfect sets of teeth, is incontrovertible; but it is also to be observed that, amongst the same classes of mankind, there are great numbers whose teeth are very much diseased.

But why should animal food, more than any other kind, produce disease in the teeth? In a chemical way, it cannot act upon them; and, if in itself it had any injurious action upon the teeth, then all carnivorous animals, whose teeth are of the same structure as the human, ought equally to be liable to caries.

The various articles of our food can only produce a diseased action in the teeth, in consequence of their being taken at a temperature either much above or below the natural heat of the body.

The experience of every one teaches, by the effects, that extremes of heat or cold are injurious, because the sudden applica-

tion of either generally occasions a very unpleasant sensation in the teeth; this painful feeling arises from irregularity being produced in the circulation within the cavities of the teeth, and also the application of an unnatural degree of heat affecting the nerves of the teeth, and producing that painful sensation consequent on such application.

The reason therefore why persons, who live in a less luxurious state, have their teeth less liable to caries is, that, their food being all of a moderate temperature, they are not injured by that frequent stimulus which is produced by the use of very hot or cold substances. This statement seems to be confirmed by the observations I have been enabled to make upon the teeth of persons inhabiting different situations.

As a general rule, I think it may be asserted that the inhabitants of warm inland countries have teeth free from disease, and that those who dwell in colder regions, and also in seaports and large towns, have bad sets of teeth. For, in all warm countries, the refreshment which always accompanies the application of whatever is cool, induces persons to make use of their culinary preparations at a moderate degree of heat, and their drink consists of such articles as are proper to allay thirst, and produce but little stimulus.

In cold countries, on the contrary, where the application of heat is congenial to the feelings, the food is taken very hot; also in these regions, and likewise in seaports and places of great commercial intercourse, strong spirituous and fermented liquors are very constantly made use of, which, in addition to the injury arising from the use of the food at a high degree of temperature, keep the mouth in constant heat, and produce all the injurious effects which arise from the accidental occurrence of fever.

The destruction of a tooth, which has become carious in the manner above described, is not the extent of the mischief, for the disease is generally communicated to those teeth which are in contact with the decayed part. Cases occasionally occur which appear to militate against this opinion; as, for instance, a tooth may become decayed, and be entirely broken away without causing any disease in the neighbouring ones. Such examples, however, are rare; and it may be asserted, as a general rule, that caries in one tooth will produce disease in that which is contiguous.

When the caries is communicated by contact, it probably arises from the action of some acrimonious discharge from the decaying tooth, which, in the first place, occasions a decomposition of the enamel, and afterwards the destruction of the tooth. But there is this peculiar difference, that, in the one, the decay pro-

ceeds from the interior to the exterior part; whilst, in the other, it commences on the surface, and extends towards the cavity.

Caries is also very frequently the consequence of the teeth being crowded so much together, as to cause them to be pressed too closely against each other. This is the most common cause of the decay of the incisors in the upper jaw, on which account, in the earlier part of life, means should be made use of to give more room, which would permit the teeth to separate, and press with less force on each other.* If the person be more advanced in years, then a small space should be made by passing a thin file between all the front teeth.

To these various causes of decay of the teeth, may be added, want of cleanliness in the mouth, and a diseased state of the gums. When the teeth are not regularly cleaned from the tartar which constantly gathers about them, and also particles of food which may lodge between them, a putrefactive fermentation takes place, which (not to speak of the offensive fetor it produces) always injures the gums, and disposes the teeth to fall into a state of decay.

The great distress which usually accompanies, and the incon-

* Vide Natural History of the Teeth, page 62.

venience which always follows, the loss of the teeth, makes the discovery of some mode of prevention of caries very desirable.

This delightful secret, although it is pretended to in the advertisements of every quack, we can only expect to acquire when the philosopher's stone and the grand panacea have been obtained. It is not in our power to alter the laws of nature, or change the natural constitution of man; we can only obviate evils by attending to the causes which produce them, and it is in this manner we can, in a very great measure, preserve the teeth from disease.

The principal means of preserving the teeth from decay consist in paying such a degree of attention to them in early life, during the period of the second dentition, as to allow the permanent teeth to acquire a proper regularity, without pressing too much upon each other; and, at the same time, if the temporary teeth should become decayed, and be in contact with any of the new teeth, they should be removed.

When these circumstances have been observed, young persons should be urged to keep their teeth very clean, and the daily use of a tooth brush, with water only, will in most cases be quite sufficient. In addition to cleanliness, the habitual use of all kinds of

food at a moderate temperature will almost certainly prevent any disease from taking place, unless there be any radical defect in the teeth themselves.

If, in persons more advanced in years, any of the teeth should have become decayed, and be in contact with sound ones, and they are not sufficiently injured to make it necessary that they should be extracted, so much of them should be filed away, as to separate them from those teeth which are sound: this will prevent the decay from being communicated.

If the teeth have become so much decayed as to leave only stumps, then they should be extracted, because they are not only liable to cause the other teeth to become diseased, but they often produce gum-boils and other diseases of the sockets.

The decay of the teeth, as far as I have been able to judge, does not appear to be peculiar to any age, temperament, or state of health. The teeth of children are very subject to this disease. I have frequently seen nearly all the temporary set of teeth decayed; and, in two or three instances, I have attended children who have been so constantly tormented with the tooth-ache as to make it necessary to extract almost all their teeth before they have arrived at five years of age.

The teeth of robust and healthy persons seem to be equally liable to caries as those of the delicate and less healthy. Nosologists mention, as one of the characteristic marks of predisposition to *phthisis*, sound teeth of a beautiful transparent whiteness. This must only be considered as an accidental circumstance, and not as a general rule; for great numbers of the persons, and especially those rather more advanced in years, who fall victims to this disease, have lost many of their teeth. The observation applies only to those delicately-formed persons who, unhappily, in our climate, so frequently fall victims to consumption. In the teeth of these persons, there is too small a quantity of earthy matter in proportion to that of the animal substance, on which account they have that fine transparent appearance.

Mr. Hunter thought that teeth did not decay after a person had passed fifty years of age; but I have had many opportunities of observing that, even on this head, no certain opinion can be formed; for I have met with several persons who have not only passed fifty years without having caries in their teeth, but who have arrived at sixty without having felt the tooth-ache, and, after that period, have been obliged to have several teeth extracted on account of the extreme pain, which the inflammation arising from caries had occasioned.

The early loss of teeth, however, cannot be considered, in itself, as a mark of short life, for there are many persons enjoying the most healthy old age, who have lost all their teeth before they had attained thirty or forty years of age.

Having stated, in the preceding pages, the causes of caries, and described its progress in destroying the teeth, it now becomes necessary to treat of the symptoms of inflammation, which usually attend this disease, and the occasional consequent affections of the contiguous parts.

The pain commonly termed the tooth-ache, is one of the most excruciating to which we are liable. It is caused by an inflammation of the membrane lining the cavity.

In inflammation, one of the usual consequences is a swelling of the part, which is generally followed by a diminution of the pain, the degree of which seems to be regulated by the resistance and compression which the inflamed vessels suffer from the surrounding parts; hence we see inflammation of a part, which may be easily distended, is not so painful as that of one situated under a tense membrane, or fascia. In the former case, the symptoms of general irritation are scarcely perceptible, whilst, in the latter, the constitution always becomes considerably affected.

These remarks sufficiently demonstrate, that in consequence of the membrane of the tooth being contained within a bony cavity, which is incapable of distension, there must necessarily exist an insurmountable obstacle to the swelling of the membrane, and this it is which renders the pain so extremely acute.

In some few instances, caries will proceed without being accompanied by any painful sensations: the tooth gradually breaks away, until the whole of it is removed; after which, the gum becomes perfectly smooth, and appears as if the tooth had been extracted.

Generally, no tooth-ache is experienced until the caries has made some progress. It is impossible accurately to describe an attack of tooth-ache, as persons are so variously affected by this malady. Some are suddenly seized with a pain darting from the tooth, through the head, so acute as almost to induce fainting. A few instances of this mode of attack I have witnessed where the patients have endured the pain for a short period, and, alarmed at a return, have been so importunate to have the tooth extracted, as scarcely to allow sufficient time for preparing the instrument, and, after the operation, they have exclaimed that the pain could not in the least be compared with the sufferings attendant upon the attack.

More commonly, at first, the pain of tooth-ache is slight, and occurs at intervals, being occasioned by exposure to cold, or the accidental pressure of some adventitious substance, such as a piece of crust, the seed of some fruit, or any thing sweet: either of these getting into a tooth, partially decayed, generally causes some uneasiness. This kind of pain may almost always be relieved by a little *tinctura opii*, or it may subside of itself. In either case, a recurrence may generally be prevented, by filling up the cavity of the tooth with some substance sufficiently hard and durable to keep out particles of food, and not liable to be acted upon by the moisture or heat of the mouth.

For this purpose wax, gum mastic, &c. have been employed, but they are soon dissolved and destroyed, therefore are improper. Formerly it was very much the practice to stop teeth with *lead* leaf, but the use of this substance ought to be forbidden, as it becomes corroded by the saliva, and the introduction of a very small quantity of this metal into the body is found to be productive of deleterious consequences: there is indeed reason to believe that, being dissolved by the menstrua contained in the saliva, it may occasion pains in the stomach, or other uneasy sensations.

On this account, nothing ought to be used but what is insolu-

ble, or, if soluble, innoxious. Gold leaf is the most proper substance: also pure tin, beaten into leaves, may be used with nearly equal advantage: it is not so durable as the gold, as the saliva gradually acts upon it, but it cannot do any injury to the constitution.

By thus excluding the air, and preventing any particles of food from lodging in the cavity, the progress of decay may be greatly retarded, the pain prevented, and the teeth preserved for many years.

If no means have been used to prevent the recurrence of the tooth-ache, it usually becomes so violent and constant, that rest is disturbed, and persons are incapacitated from pursuing their accustomed avocations: when this is the case, the tooth should be extracted.

There is scarcely any thing occasions so much fear as the idea of the extraction of a tooth, and this very dread is often the cause of most unpleasant consequences.

The inflammation proceeds from the tooth, and affects the contiguous parts, the gums and the integuments of the face swell, and become much inflamed. The swelling is often so

great, that the mouth cannot be opened, and the eye becomes closed: in other cases, the swelling extends down the neck, and the constitution is affected with the symptoms of general irritation.

Sometimes the inflammation and swelling will subside, and resolution take place, but most frequently it terminates in suppuration. Now and then, after the matter has been discharged, the pain will cease; but, as the diseased tooth remains, the symptoms are liable to recur upon every exposure to cold. Whenever the gums are inflamed, the alveolar processes are also affected, and they are removed by the process of absorption. If a person should have had formation of matter two or three times about the fangs of a tooth, the sockets will be so much absorbed that the tooth will become loosened: in this state, it causes so much trouble, that the patient is obliged to have it extracted, and a cure is thus obtained.

The inflammation is sometimes so great as to extend to the substance of the jaw bone, and even to occasion its partial mortification.

The distress attending the process of exfoliation, and the

consequent deformity, should warn all persons against exposing themselves to the hazard of such an occurrence.

The pain proceeding from the inflammation of the membrane of a carious tooth is not of the same kind in all persons, arising probably from some peculiarities of constitution, for it not only varies in its intensity, but likewise the sensation excited.

Some describe it as a gnawing kind of pain, not amounting to acuteness, but being constant, and admitting of no continued relief, it renders them unfit for either mental or bodily exertion. In others, it comes on suddenly, occasioning an acute pain, as if an instrument had been passed through the jaw: this occurs at intervals, and the expectation of an attack often causes as much anxiety and distress as the pain itself. In others, the pain is periodical, there being an intermission of some hours. In these cases, bark has been sometimes exhibited with a degree of success; but, at length, patience being exhausted by the continuance of the pain, extraction of the tooth has been the only remedy.

The pain often follows the course of the nerves, being diffused all over the cheek, shooting up to the temple, and affecting the head generally.

It frequently happens, that, when either of the *dentes sapientiæ* of the under jaw occasions pain, the patient does not suffer so much in the tooth itself as in the ear.

I have also frequently observed that the last tooth of the upper jaw, when diseased, has occasioned many confused sensations, the pain most commonly has been referred to the first or second molares, and with the greatest difficulty could patients be persuaded to have the *dens sapientiæ* extracted.

These sympathetic pains, arising from carious teeth, proceed from the intimate connection which subsists between the branches of the fifth and those of the seventh pair of nerves. The pain in the ear is therefore sympathetic, arising from disease in the *dens sapientiæ;* it is caused by a union of a branch of the seventh pair of nerves with the lingual branch of the fifth pair; this nervous filament enters the cavity of the *tympanum*, passes on the inner side of the *membrana tympani*, and is called the *corda tympani.*

From the connection which subsists between these two pairs of nerves, it happens that not only inflammation in the teeth causes a sympathetic pain in the ears, but disagreeable and unharmonious sounds produce a sympathetic effect upon the teeth, and occasion that unpleasant sensation called the teeth being set on edge.

In that disease of the nerves called *tic douloureux*, the teeth are generally suspected to be the seat of the pain.

In the Medical Records and Researches is a very excellent paper on this subject, by Dr. Haighton. The disease is there described as chiefly affecting the fifth and the seventh pair of nerves, and the doctor relates several cases of persons, affected with this disease, having submitted to the extraction of a great number of teeth, before the true cause of the pain had been ascertained. I have had the opportunity of observing a few of these cases, one of which I shall relate, on account of the remarkable benefit which followed the operation, as recommended by Dr. Haighton. An elderly gentleman applied to me for the purpose of having some stumps extracted from the upper jaw, stating that he suffered considerable pain from them; without further enquiry, I performed the operation. Two days afterwards, he came to me again, and expressed a wish that I would extract the teeth which were remaining on that side of the upper jaw. The teeth to which he directed my attention were two molares, both of which appeared to be perfectly sound. I then enquired what his particular kind of pain was: he described it as a pain which had come on at intervals for nearly two or three months past; at first it was slight, but had gradually arisen to such a degree of acuteness as almost to cause fainting: whilst he

sat still he was easy; but, if he spoke quickly, or ate any thing which required mastication, or walked hastily, or was shaken by riding in a carriage, the pain returned, shooting through his cheek, and affecting his teeth and all the side of his face, as if he had received an electric shock. I had the opportunity of seeing him during two or three of these painful attacks. Whilst he was relating to me the above statement, he was seized with so much pain, that he suddenly stopped, and the water streamed from his eyes. On comparing his description with what I then saw, I immediately conceived that his complaint was caused by a disease of the suborbitar branch of the fifth pair of nerves, and offered to accompany him to Mr. Astley Cooper, in order to take his opinion. As I went with him in the coach, a sudden jolt caused another attack. Mr. Cooper, after having heard the above statement, concurred in the opinion I had given, but was more particularly confirmed in it by producing another attack, by only rubbing the hair of his beard contrary to its natural direction.

The gentleman assented to the operation, which Mr. Cooper performed immediately. The nerve was completely divided, as the power of raising that side of the lip ceased, and it remained as in a state of paralysis. The wound healed in a few days, after which the pain entirely left him, he could eat with comfort and

take exercise without fear. His joy was so great at the deliverance which he had experienced from so much suffering, that he could not afterwards speak of it without shedding tears.

Sometimes when persons suffer extremely with the tooth-ache, they find a great difficulty in fixing upon the tooth from which the pain proceeds; and it is not uncommon for them to refer it to a tooth not in the least connected with the seat of the disease: frequently they will fix upon a sound tooth, and it often happens that the pain is conceived to originate from a tooth of the upper jaw, instead of one of the under jaw, and *vice versa.*

Whenever any doubt is expressed, great caution should be observed previously to the extraction of the tooth. The teeth may be examined by striking them with the end of a pair of forceps, in order to discover that which is the most tender; as it usually happens that a tooth in a state of inflammation is so sensible that it will not bear to be struck without pain. If this mode of examination be not satisfactory, and there should be more than one carious tooth, they should be carefully examined by picking the hollow part with the point of a probe, or other small pointed instrument, bent in the form of a hook; by doing this, the exposed nerve of the tooth, that has caused the pain

may be touched, which will immediately assure the patient and the surgeon of the tooth from which the pain proceeds.

I shall now proceed to state the mode of treatment necessary to be adopted in the different stages of caries. In the preceding pages, I have shown that the progress of caries may be retarded, and the patient be preserved from pain by keeping the cavity of the tooth constantly and completely stopped. Beneficial as this practice really is, there are some cases in which it cannot be adopted; such are, an unfavourable situation of the decay, or its being so superficial as not to afford depth sufficient to retain the gold leaf.

When the decay is situated on that side of a tooth which is in apposition to another, so that persons say, the decay is between two teeth, it is always difficult, and frequently impossible, to retain the stopping; in which case, great inconvenience arises from the food lodging in those cavities, whence it is not easily removed: great benefit will here be derived from passing a file between the teeth, in which operation the opening should be so much enlarged as to allow a quill tooth-pick to be used with ease. If the caries has affected one tooth only, the next to it will be preserved by filing away as much of the decay as possible, and, should it not have made much progress into the body

of the tooth, the remainder may be preserved for a number of years by the removal of the more carious part.

The success of the operation of filing away a decayed portion of a tooth must not always be regarded as certain, for, in some instances, the decay proceeds so rapidly, that it cannot be checked by any means: likewise the file cannot at all times be used, the position of the teeth rendering its application not only inconvenient but impracticable.

In the Natural History of the Human Teeth, p. 64, I have described the ill effects which usually arise from the incisors being too closely placed against each other, and I there stated the mode of obviating them. If the teeth, in this state, have been neglected until persons have arrived to adult age, considerable advantage will be obtained from separating them by a very thin file, as it is on the sides of these teeth that the caries commences in the form of black spots.

If caries has proceeded in the manner dilineated in Plate II. fig. 1. a file rather thicker may be used, so as to separate the teeth as in fig. 2. If one tooth only be injured, the file should be smooth on one side, in order that no part of the enamel of the sound one may be removed.

When the decay has considerably advanced, a small round, or half round file may be used, and it should be carried into the mouth in an oblique direction, so as to preserve as much as possible of the front part of the tooth; should the filing cause much pain, from the great sensibility of the tooth, the operation ought not to be continued, as it may render the patient liable to future tooth-ache, by causing an exposure of the nerve. In these cases we may file a little at a time, until the decay has been nearly or quite eradicated, recommending during the intervals the application of spirit of wine to the decayed parts, which tends to harden the carious substance of the tooth, and to diminish its sensibility.

Supposing the decay to have extended into the cavity of the tooth, it will be better to omit the filing altogether, and endeavour to stop it with gold leaf.

The means which have been employed to relieve the pain arising from inflammation of the membrane of a tooth, are attended with very different success; some persons deriving benefit from one application, and others from another.

Whenever tooth-ache exists, without any sympathetic affection of the gums or socket, those medicines which tend to dimi-

nish nervous sensibility afford relief; opium conveyed into the tooth, either in the form of tincture, or solid opium, frequently succeeds. Camphor, the smoking of tobacco, essential oils of cloves or of thyme, the concentrated acids, &c. are also recommended, and with occasional effect.

It is most extraordinary, but not less true, that there is scarcely any pain to which the human body is subject, that is so much under the influence of the passions of fear or hope, as the tooth-ache; this is experienced by almost every patient, and as constantly observed by every surgeon, by the pain generally leaving that individual who is under the immediate expectation of having the tooth extracted.

Empirics are not wanting who take the advantage of this circumstance, and pretend to cure tooth-ache by certain charms and nostrums: indeed, at the moment they often appear to be successful, from the passions of fear or hope causing a temporary suspension of pain.

The burning of the *antihelix* of the ear, in order to relieve this complaint, must be ranked amongst the above methods of cure; it is one not worthy of notice, had it not been formerly a very popular remedy, and lately recommended in a periodical publication.

The slightest knowledge of the distribution of the nerves to the teeth must convince every one, that a division of any part of the ear cannot separate the connection which subsists between the teeth and the principal branches which go to the brain, and therefore no more benefit can be derived from this formidable operation, than may be attributed to the influence of fear.

When the carious part of a tooth is very sensible, the pain not being constant, but only excited by some cause of irritation, it is much in the same state as an irritable ulcer, and the pain may be relieved in a similar manner, viz. by destroying its surface with caustic. This method of treatment was first mentioned to me by Mr. Abernethy, as one that he had tried with great success, and which I have also found to be very beneficial.

The cavity of the tooth is first to be wiped dry with a small piece of lint, or cotton, then some lunar caustic, in solution, may be introduced on the point of a camel's hair pencil, spreading it over the whole of the carious surface. This should be repeated two or three times, after which, if the tenderness be removed, the tooth may be stopped with gold leaf, and thus be preserved.

Attempts have been sometimes made to destroy the nerve with the actual cautery, by introducing a red-hot wire; but I

have scarcely ever found this plan to be effectual; and, as it always gives great pain, and sometimes produces an increase of inflammation, I think it is better never to recommend it. Indeed, all applications are very uncertain, and therefore, if relief be not speedily obtained, it is advisable to suffer pain once for all, by having the tooth extracted.

Some years since I attempted a mode of destroying the nerve, which at first promised to be very successful. I knew that a nerve once divided did not reunite for a considerable length of time, and therefore concluded, that if I could separate the nerve going into the tooth from the principal branch, that the pain would be prevented, and useful teeth might be thus preserved.

The method which I adopted, was to raise the tooth, by the common operation of extraction, so high in the socket as certainly to break the nerve and vessels which enter the extremities of the fangs; then, on withdrawing the force, to press the tooth back again into its former situation. I not only recommended this operation, but also performed it upon a great number of persons, and for a short time flattered myself with very sanguine expectations; these, however, were quickly destroyed, for some of my patients, in about three or four weeks

afterwards, came complaining of pain, and were anxious to have the tooth completely removed. They did not suffer the tooth-ache so acutely as before, but the tooth had become sore, and was protruded from the socket, so that, whenever the mouth was closed, the pressure of the teeth in the other jaw against the tender one occasioned great pain.

On extracting these teeth, I found the fangs covered with a considerable quantity of coagulated lymph; which circumstance led me to believe, that this operation could not be recommended with any certainty, as it only succeeded in those cases in which union of the fangs to the socket took place, as it were, by the first intention; but if any inflammation followed, so as to produce an effusion of lymph, it caused a thickening of the periosteum, and a consequent protrusion of the tooth, which induced a necessity for its complete removal. Since that time, I have only followed this practice in cases where a tooth has been but slightly decayed, and the patient has been very desirous to suffer any experiment for its preservation. In a great number of cases it has perfectly succeeded; but I have always represented the possibility of its failure.

The incisors of the upper jaw, although very liable to become carious, do not often occasion the tooth-ache; but when this is

the case, I always recommended the extraction of the tooth before any inflammation has affected the gum; the decayed part of the tooth may then be removed, or the cavity be very perfectly stopped with gold leaf, and it is then to be returned into the socket. The fangs of these teeth being straight and conical, renders this operation almost always successful; the tooth soon becomes perfectly fixed, and may remain many years useful for the articulation of sounds, as well as ornamental to the sight.

The other diseases of the teeth, which have been mentioned as resembling those with which bones are affected, namely, *exostosis*, *necrosis*, and *spina ventosa*, differ essentially from caries, both as to the part which first becomes diseased, and also in the pain which follows. In these diseases we have morbid affections of the fangs producing consequent diseased appearances of the sockets.

OF EXOSTOSIS OF THE FANGS.

One of the species of *exostosis* in bones, is an enlargement arising from a deposit of bony matter, so compact in its structure as very much to resemble ivory. This is that kind of enlargement to which the fangs of the teeth of some persons are liable.

The cause of this disease is obscure, and the slow increase in the size of the fang is the reason why pain does not occur until a considerable augmentation of its bulk has taken place.

It is sometimes found to exist where the crowns of the teeth remain perfectly sound; in other cases, it appears to be the effect of indolent inflammation, arising from caries in the body of the tooth, and extending to the fang. This kind of disease does not produce suppuration; the gum continues quite healthy; but, whenever pain occurs, as no permanent relief can be obtained without the extraction of the tooth, it becomes necessary, when the teeth are sound, to be very attentive to distinguish this disease from mere rheumatic affections of the jaw bones.

In Plate I. fig. 12, are two teeth, the first molaris of each side of the lower jaw, which I extracted from a lady, who had complained, for a considerable length of time, of pain on both sides of the face, arising from each of these teeth. She described her symptoms to be, a constant uneasiness, like the gnawing sensation of rheumatism, which, continuing almost without intermission, exhausted her health and spirits. The teeth and gums were quite free from any diseased appearance, the pain therefore was considered as rheumatic: she had taken much medicine, and continued under the care of an eminent

practitioner, for a considerable length of time, without receiving any benefit. The gums were lanced, blisters were applied behind the ears, but all means were ineffectual: she at length determined to have both of the teeth extracted. This was reluctantly performed, because they appeared to be perfectly free from disease.

When one tooth was removed, the cause of her complaint became evident, for the whole surface of the fangs was increased in size by the irregular addition of a quantity of bony matter. This induced me to comply with her wish of removing the other, which had precisely the same appearance. The cause of her pain now became certain; the increase in the size of the fangs necessarily occasioned a distention of the alveolar cavity, and kept up a constant uneasiness. The lady was immediately relieved, and recovered her health and spirits, to the great joy of her family, who were nearly deprived of her society, by reason of her excessive nervous irritability.

Where this disease has occurred in teeth already carious, the persons have not been afflicted with extreme tooth-ache, but they have had occasional uneasiness, which at length has become more uninterrupted, and the tooth has projected to a certain degree from the socket, so that in closing the mouth the tooth felt as if out of its natural situation, thus rendering mastication

painful. When extracted, the fangs have been found enlarged as in the teeth represented in fig. 13, Plate I.

Some persons will refer this appearance upon the fangs of the teeth to an original mal-formation; but so different is it in appearance from the smooth structure of any ill-formed, crooked, or undiseased tooth; and when extracted, so much whiter than any other part of the fang; that it can only be referred to diseased action, occasioning a deposit of bony matter, as in other cases of *exostosis.*

Of this disease of the teeth, the most extraordinary case on record occurred to a young lady scarcely twenty years of age. The following letter, from the surgeon who had attended the lady, and by whom she was introduced to me, presents a full narrative of the case.

Sir, *9th Nov.* 1809.

Miss —— the young lady who will deliver this to you, has been under my care for near twelve months, with a very extraordinary complaint in her face, teeth, and gums. It commenced with a deep-seated pain in the face, confined principally to one side, returning most mornings at about eleven o'clock, and continuing several hours. This had gone on for near three

months, before she, or her friends, thought it sufficiently serious to call in any medical assistance. When first I saw her, she had suffered great pain all that day, from the teeth, gums, and face: on one side the gums were rather swollen and inflamed; and as one of the teeth was slightly decayed, I thought it most advisable to extract it, which gave relief till the next day, when the pain returned with still greater violence, so much so, that she was desirous of having the adjoining tooth taken out, which she fancied gave her more pain than the rest. This had the same effect as the other, only giving relief till the next day, when the pain returned with equal violence. I then tried scarifying the gums, cold lotion to the face, giving at the same time a brisk purgative, and afterwards an opiate. This was continued for a short time without abating the pain; I then changed the plan for the more soothing one of fomentation and poultice, applying a fig to the gums, occasionally changing it for a crust of bread soaked in warm milk, taking at the same time a saline and opiate draught every four hours; but with just the same effect as the preceding remedies. In short, the pain in the teeth and face continued, the gums became partially ulcerated, and in the course of six months, I was under the necessity of extracting, at different times, all the teeth in the lower jaw, excepting the four incisors, which very soon became affected in a similar way to the rest: these her friends would not allow to be drawn; nor

was I desirous of performing the operation, as the removal of the others did not appear to have given any permanent relief, excepting that the gums healed, and remained well where the teeth had been extracted. During this time almost every remedy that could be thought of was tried, snch as frequent scarifying of the gums, leeches, permanent blisters to the lower jaw and behind the ears, astringent lotions, as the infusion of roses with the tincture of myrrh, decoctions of bark, oak bark, infusion of galls, solutions of alum, argentum nitratum, salt and water, lemon-juice, oxymel æruginis, borax, charcoal and soda, tepid bath, artificial sea bath, and afterwards sea bathing, seton in the neck, issue in the arm, &c. &c. with a great many other applications which it would be useless to name. Internally she has taken strong purgatives, calomel combined with antimony, and afterwards continued alone in small doses to salivation, solutio mineral. solut. calc. muriat. bark, with nitrous acid, steel, lemon-juice in large quantity, tinct. opii. to the amount of gut. 60 at bed time, and repeated in small doses during the day at short intervals, cicuta, &c. &c. prescribed by an eminent physician of this place, without receiving little more than slight temporary relief from any one medicine prescribed. She has now all the teeth of the upper jaw affected in a similar way to the lower; the palpebræ of one eye have been closed for near two months, and, when opened,

can discern objects but very imperfectly; the secretion of saliva has for some time been so copious as to flow from the mouth whenever opened. She is now come to London, purposely for advice, and I have recommended that she should call upon you.

I remain, Sir,

Your obedient Servant,

T. S.

This letter not only fully describes the very afflicting case, but also shows that medicine under every form had altogether failed: of course no benefit could be expected from a repetition of any similar treatment.

At the time I saw the lady, she was only able to take fluid nutriment, for the teeth of the upper jaw were so very tender that the slightest touch caused extreme pain. As described by Mr. S. the flow of saliva was so considerable that there was a continual necessity of discharging it. The lady herself said she was assured she should never get well, unless all her teeth were extracted. It was however desired if possible to seek such relief as should prevent so painful an expedient which could only be regarded as the last resort.

Dr. Babington and Mr. Cline were consulted, who prescribed a blister on the head, to be kept open by the application of the *ceratum sabinæ*. This was tried without success. The pain in the mouth, the soreness of the teeth, and the general irritation on the constitution, all combined to render the extraction of the most painful tooth advisable. This was the first molaris of the upper jaw, situated under that eye, the palpebræ of which had become closed.

The fangs of this tooth were much enlarged, and from the periosteum being greatly thickened, the fangs had the appearance of being cartilaginous. The removal of this tooth was attended with great benefit; as, in two days after the operation, the affected eyelids so much recovered, as to open simultaneously with those of the other eye. This relief unhappily was of short duration: and as the other teeth remained very sore, the lady determined to have them extracted one after the other. She submitted to this operation, every two or three days. The fangs of those teeth which had caused the most pain, were the most enlarged; but each partook of the disposition to *exostosis*.

The relief from pain which was experienced by the loss of the teeth was so great, that with the utmost resolution this afflicted lady persevered until every tooth was extracted. After the

loss of the teeth, from time to time, portions of the alveolar processes exfoliated, which rendered it necessary to scarify the gums. I am happy to say that a material improvement has taken place in the general health, although not so perfectly as could be desired. One most important benefit resulted from the removal of the teeth, in arresting the progress of the other diseased actions: for the other eye had begun to be affected; and sometimes was so dim, as scarcely to enable the lady to guide herself about the house. In point of appearance, however, I had the satisfaction of completely restoring the lady, the teeth which had been extracted were replaced, as an artificial set; which, with the greatest comfort, she has now used for more than twelve months.

OF NECROSIS AFFECTING THE TEETH.

When a bone, or part of a bone, has completely lost its living principle, it is precisely in the same state as soft parts when affected by gangrene: no restoration of the part can be effected, the surrounding parts become inflamed, and an action takes place, which has for its object the separation of the dead from the living part. When the fang of a tooth has lost its life, the whole of the tooth becomes, in consequence, an extraneous body; and, as in bones, the cure of *necrosis* depends upon the

exfoliation of the dead piece; so, in the case of the tooth, the cure can alone be effected by its entire removal.

This disease usually affects teeth which are perfectly free from caries; and it is more particularly confined to the front teeth, the others being rarely affected in this way. When the fang of a tooth has lost its living principle, the socket becomes inflamed, the gum appears of a darkish red colour, loose in its texture, and matter begins to be discharged. In some, the discharge is from two or three orifices through the gums, opposite to the extremity, or the middle of the fang of the tooth; in other cases the matter passes out at the neck of the tooth. In all, there is an uneasy pain, and the discharge of the matter is very disagreeable.

During the progress of this disease, the alveolar processes are absorbed, and the teeth are loosened, from which great inconvenience arises.

In the early stage of this disease, considerable benefit attends the scarification of the gums; the loss of blood abates the inflammation; and, as it is very unpleasant to lose a front tooth, we may, by repeatedly lancing the gums, arrest the progress of the disease for a considerable time; but, when it has proceeded

so far as to loosen the tooth, it is better to extract it, especially as the whole of the uneasiness arises from the tooth being an extraneous body; the discharge then ceases, and the gum becomes perfectly healed in a short time. After extraction, the fang of the tooth is always found to be very rough; in most cases it is dark coloured, being of a deep green, brown, or black colour. In Plate II. are several teeth illustrative of this appearance.

OF THE DISEASE RESEMBLING SPINA VENTOSA.

Spina ventosa is the term usually given to that species of tumor in bone, which is originally an abscess forming in the centre: the ulcerative process removing the bone from the inside, whilst there is a correspondent increase on the outside.

This disease, according to my observation, is confined to the incisors and cuspidati of the upper jaw; it produces upon the gum and socket similar effects to the disease last described. The seat of the malady is in the cavity of the tooth; the vessels ramifying on its membrane acquire a diseased action, by which the membrane becomes thickened, absorption of some of the internal part of the tooth takes place, and the opening at the extremity of the fang also becomes enlarged. This disease of

the membrane is attended with the formation of matter discharging itself at the point of the fang into the alveolar cavity, which, being rendered more porous by the process of absorption, affords an easy exit. During the progress of the disease, the gum covering the alveolar process becomes inflamed, and acquires a spongy texture; the matter passing from the socket makes its escape into the mouth by several openings through the gum, which is thus kept in a constant state of disease. The discharge, which is generally considerable, produces great fetor of the breath, the taste is constantly affected, and the socket is gradually absorbed until the tooth becomes quite loose.

When the tooth has been extracted, I have usually found the membrane sprouting at the end of the fang, the internal part of which is much enlarged, and the external part has a rough, scaley appearance; also, during the progress of this disease, the body of the tooth changes in appearance, and gradually acquires a dark colour.

The only treatment which can be observed here, is to scarify the gums occasionally, and to wash the mouth frequently with an astringent lotion; for this purpose, the infusion of roses with tincture of myrrh is very beneficial. As no cure of this complaint can be expected, the extraction of the tooth should be

recommended as soon as the gums have acquired a truly diseased appearance; for, if the disease be allowed to take its natural course, the gums become so extensively affected as to induce absorption of the alveolar processes belonging to the neighbouring teeth, which is followed by their consequent loss.

OF THE REMOVAL OF THE ENAMEL BY THE DENUDING PROCESS.

This is a disease producing a change in the teeth, by which they acquire an appearance unlike that of caries, but attended with a loss of substance.

The tooth does not, as in caries, become softer, nor, like that disease, does it originate in inflammation, but it consists in a removal of the enamel from the bone of the tooth, as if by solution and gradual abrasion.

It affects the incisors much more frequently than any other teeth, and, in all the cases which I have seen, its operation is limited to the exterior surface of the teeth.

The first appearance is in the enamel of one or more of the incisors becoming thinner, and appearing as if a small portion

had been scooped or filed out, occasioning a slight depression. This removal of the enamel continues until so much is taken away as to leave the bone exposed: as this denuding process, according to Mr. Hunter's term, advances, the tooth changes in its colour, gradually becoming yellower, as the bony part is more exposed. When the whole of the enamel is destroyed, part of the bone is also removed: the remainder acquires a brownish hue, is very highly polished, and will often remain in this state for a number of years.

I have seen a few cases in which the teeth have been so much wasted, as to have all the anterior part removed; but yet the natural cavity has not been exposed, for the bone has remained in a prominent line, as it were defending that particular part, and thus preventing pain.

Sometimes teeth thus affected become tender, very susceptible of cold, and are made uneasy by the use of acids.

It is difficult to make a very good engraving of this disease. Fig. 3. Plate II. is designed to show the common and early appearance of it. In other cases there is an appearance as if a small round file had been applied to the anterior surface of the

teeth, close to the gums, removing a considerable portion of them, but leaving the surface exceedingly smooth.

Fig. 4, is intended to describe this appearance as extending across the necks of all the incisors of both jaws. In these cases the molares participate in the disease.

Fig. 5, are two cuspidati, in which are very great depressions, as if made by a round file.

I am not able to assign any cause for this loss of the enamel and part of the substance of the tooth, especially as it is confined to that portion of the teeth which could not be acted upon by the friction of one tooth against another. I have observed it both in healthy and delicate persons. As it appears to be connected with some cause which may produce a solution of the enamel, it is very possible that the saliva may have some influence, and that the friction of the lips may contribute to the removal of the enamel.

The only means to prevent a rapid progress of this disease, is to avoid whatever may contribute to it; therefore, as all acids act powerfully upon the teeth, their use as an article of diet should be forbidden: and, whenever there is any necessity for

employing a medicine which contains an acid, persons should be extremely careful to rinse the mouth, and wipe the teeth immediately afterwards with a cloth.

Of the WEARING of the TEETH BY MASTICATION.

The mouths of some persons are so constructed, and the teeth so placed, that, when the jaws are closed, the incisors, not being so long as they usually are, meet each other at the cutting edges. Thus a variety is formed from the usual mode, which is for the incisors of the upper jaw, when the mouth is closed, partially to overlap those of the under jaw.

When the teeth meet in the manner above described, they all act upon each other, and the jaw has a much more extensive lateral motion. This occasions greater friction in mastication, by which the teeth gradually wear away a part of each other. In some persons they become worn down equally all round the mouth, whilst in others, who have acquired a habit of masticating their food on one side only, the teeth which have been in constant use are worn down, the others remaining quite perfect. The same circumstance also happens, if persons, by reason of caries, have lost several teeth in the early part of life: those which have remained have become very much worn away. I

have seen a gentleman whose teeth were so much worn down as to have the whole of the crowns removed, leaving only the fangs in the jaws even with the edges of the gums.

It is not unfrequent for teeth in this state to become tender; the application of cold or acids excites considerable pain, but this generally soon subsides; for, during the time that the teeth are wearing away by their action upon each other, a process goes on in the cavity, by which their sensibility is destroyed; the vessels take on a new action, and deposit ossific matter until the whole cavity is completely obliterated. This circumstance also happens very frequently in the teeth of old people, which accounts for their not being so liable to the tooth-ache.

OF FRACTURES OF THE TEETH.

The teeth are liable to be fractured by blows, which may be inflicted either by accidents, or from malicious intentions. The incisors of the upper jaw are the most exposed to these accidents: boys, in their various amusements, occasionally receive blows in the mouth, which not unfrequently occasion fractures of the front teeth.

In falling upon the face, the teeth are sometimes struck

against a stone ; in throwing of stones at each other, one may be received against the teeth ; in an incautious attempt to catch a cricket ball, the force of which is not sufficiently spent, it may come with violence against the mouth : in these, and other similar ways, persons are subjected to fractures of the teeth ; also, in the mastication of food, hard substances, such as a splinter of bone, or a small stone, or a shot in game, may unexpectedly be bitten upon, at which time the muscles of the lower jaw, being in very strong action, exert a force sufficiently powerful to fracture a perfectly sound tooth.

The treatment of these cases will depend much upon the extent of the injury. If a small piece be broken off from the point of a tooth, nothing more will be necessary than with a fine file to make the rough edge smooth.

A tooth rarely becomes carious in consequence of an accident of this kind; for, if there be no predisposition in a tooth to decay, the mere removal of a small portion of it will not cause caries.

A fracture of a tooth occasions inconvenience in proportion to the injury done to the cavity of the tooth. If it should extend nearly into the cavity, having left only a thin piece of

bone to cover it, the person will be subject for some time to pain on exposure to cold air; this, however, is generally cured by a deposit of bone taking place within the cavity, by which the nerve is defended, and the tooth may remain during life without exciting further trouble.

If the fracture should extend into the cavity, the membrane will immediately be exposed, and inflammation will follow. In this case the treatment must be regulated by the age and peculiar circumstances of the patient. If the accident should have happened to a youth under fifteen or sixteen years of age, it would be better to extract the tooth, because the teeth on each side will gradually approach each other, so that when he is arrived at maturity the loss may never be observed.

It is to be understood that I am speaking of accidents occurring to the permanent teeth; blows received by children under five or six years of age can only injure the temporary teeth; sometimes by accidents one or more of these are beaten out: this never fails to produce alarm in the minds of the parents; but, as in a short time a removal of those teeth must have been affected by nature, or performed by art, it cannot be considered as a permanent injury.

If the case be neglected for some time, the inflammation extends to the fang and socket, and produces a considerable gum-boil, which can only be cured by the extraction of the tooth.

When an accident of this kind occurs to a person more advanced in years, the loss is very considerable, as the appearance of the mouth and also the speech becomes thereby much affected.

In Plate III. fig. 9, is a representation of two central incisors which were broken by a fall. Fig. 10, is the posterior view of these teeth, the fracture of which will be seen extending into the cavity.

In an accident of this kind affecting either one or both teeth, if the person should apply for assistance immediately after the accident, and before any inflammation has supervened, I should recommend that the tooth or teeth be extracted with great care. When this has been done, the cavity in the tooth should be cleared out as much as possible, and some gold-leaf be introduced, so as completely to fill it up.

After the cavity has been thus stopped, the teeth are to be restored to their sockets, and there to be confined by a ligature;

they will soon fix, and in a few days be as secure as ever, and may afterwards remain without inconvenience for a great number of years.

If the fracture of a tooth should be so great as in fig. 11, the patient must submit to extraction: or, if he should be desirous to preserve the appearance of his mouth, he may be recommended to have the remainder of the tooth filed away, so as to make the fang even with the gums, and, in the manner here after to be described, have a tooth fixed to the fang by means of a pivot.

When a blow has been received upon a tooth so as to loosen it, if the person be young, it will become fast again; but it gradually loses the whiteness of its colour, and at length acquires a bluish tinge.

When the like accident occurs to a person rather advanced in life, a disease usually takes place about the fang, which eventually affects the socket; the tooth then becomes very loose, and must be extracted.

A young gentleman had the central incisors broken by a cricket ball, as represented in fig. 9. The fracture did not ex-

tend into the cavity. In this case the teeth were filed so as to remove the irregular portion, and bring them as nearly as possible into a line with the other teeth.

Fig. 10 represents a posterior view of the central incisors of a young gentleman, who, falling on his face, struck his mouth against a stone. So much of the teeth were broken off as to uncover the membrane; the entrance into the cavity is described by the dark spots, *a a*. Immediately after the accident, the mere touch of the tongue passing over the exposed part of the membrane occasioned extreme pain: in a short time, inflammation extended to the socket, the lip became very much swollen, and a considerable quantity of matter was formed. The parents, being very desirous to preserve the teeth, made use of every means to abate the inflammation; but, as the gums remained thickened, and the discharge of matter continued, they were at length obliged to consent to the extraction of the teeth: on examining the fangs, they were found covered with a considerable quantity of lymph, which is a common consequence of a neglected accident of this description.

In fig. 11 is the representation of the teeth of a young gentleman who had the central incisors broken by a blow of a stick:

being anxious to have the deformity removed in the best possible manner, he was willing to submit to any means that should be recommended. I stated to him the necessity of preserving the fangs for the purpose of fixing other teeth in a permanent manner; but, perceiving that the sensibility of the exposed membrane was very great, I concluded that he would not be able to endure the pain attendant on the common mode of destroying the nerve, therefore determined to extract the teeth partially, and return them back into the socket; after which I introduced an instrument, and passed it up to the extremities of the fangs, without occasioning the least painful sensation. Union of the fangs to the socket took place in a few days, when the remainder of the crowns of the teeth was filed away, and other teeth fixed.

If a blow be inflicted with sufficient violence to remove a tooth from its socket, it may be returned again; and, if secured to the other teeth by a ligature, it will become fast in a few days. I have known a case in which a tooth had remained out of the socket for six hours, and yet, when returned, became again perfectly united. It will be necessary when a tooth has been out of the socket for some time, to introduce a probe, and remove the coagulated blood; the fang may then be inserted with ease,

and inflammation will be avoided. But when the teeth have been loosened or beaten out by a blow, and the alveolar processes have been injured, or fractured, the teeth will never become perfectly fast; inflammation arises, and nothing but extraction will effect the cure.

OF THE DISEASES OF THE GUMS.

THE alveolar processes of both jaws are covered by a substance which is called the gums. They have a semi-cartilaginous hardness, are very vascular, and possess considerable contractability. Under slight inflammation, occasioned by cold, they become thickened, enlarged, and swollen, and of a loose, spongy texture.

The gums adhere to the necks of the teeth, and pass between each of them, being attached to the bony partitions of the alveolar processes, by which the inner and outer gums are connected together.

When the gums are in a healthy state, they are firmly attached to those parts of the teeth which are not contained in the sockets, and their extreme edges lie upon the enamel. The gums, which are between the teeth in the upper jaw, descend lower; and, in the under jaw, are situated higher than the other parts: hence, at the necks of the teeth, they form an arched

appearance. Naturally, they do not possess much sensibility, and therefore are not injured by the friction which is unavoidably occasioned by the mastication of hard substances; but, when inflamed, they acquire such extreme sensibility, that even the pressure of the cheek causes pain.

In infancy, during the progress of dentition, should there be inflammation of the gums, the slightest touch produces so much suffering, that children will even refuse the breast, on account of the pain attending the necessary pressure of the nipple. On the contrary, when there is no inflammation, the gums are so insensible, that they are pleased with sucking or biting a hard crust. In old age, when there are no teeth, the gums possess so little sensibility, that the biting or bruising of food is attended with no pain; and it is remarkable, that those who have lost all their teeth enjoy their food much more than those who have only a few weak ones left.

Several affections of the gums originate from diseases of the teeth, but there are others peculiar to the gums themselves: I shall first describe those diseases which arise from the teeth.

OF GUM-BOILS AND ABSCESSES.

Carious teeth frequently become inflamed at the root, and suppuration takes place in the socket, attended with swelling and soreness of the gums. In these cases, the same laws are observed for the exit of matter as in abscess in general, viz. ulceration takes place in some part of its surface, so as to make an outlet for the matter in the best possible situation. When matter forms at the root of a tooth, the periosteum which covers its fang thickens, and in some cases becomes detached from it; the matter is accumulated as in a bag, by the extension of which, considerable pressure is made against the sides of the socket, the consequence of which is, that that part of the alveolar process, situated on the outside, becomes absorbed, rather than that within the mouth.*

The ulcerative process continues until the gum bursts, nearly opposite to the place where the point of the fang is situated, and thus the matter escapes from this natural opening: the edges of the opening are generally raised, having the appearance of a small, red fungus; sometimes, after the discharge of the matter, the inflammation will subside; but the gum-boil rarely disappears, and a small fistulous opening remains, at which, matter

* Plate I. fig. 10, 11.

continues to be discharged; or, upon taking cold, persons are liable to a recurrence of inflammation, occasioning a reaccumulation of matter; but which is seldom attended with much pain. These gum-boils, being occasioned by diseased teeth, are seldom cured without their removal; but, as the operation of extraction cannot always be submitted to, means must be employed to render them as little injurious as possible.

At the first appearance of a gum-boil; that is, as soon as the gums, by their swollen condition and soft feeling, together with the sensation of throbbing pain, indicate that matter is already formed, a puncture should be made with a lancet, in order to suffer it to escape: this will relieve the pain, and prevent any extensive effusion.

Sometimes the tooth becomes very sore, and rather loose, in which case, as it will never be serviceable, it would be far better to extract it, which will prove a cure to the gum-boil.

When the inflammation occasioned by a carious tooth is very great, we should be particularly careful to guard against its effects. The formation of matter is often so considerable, as to produce an abscess of no small extent. In some cases the matter is contained within a cavity, extending through the length of one

side of the jaw. The teeth which produce the most distressing symptoms are the *dentes sapientiæ* of the under jaw; when inflammation extends from either of those teeth to the contiguous parts, the swelling is speedily diffused over all the cheek, so as to close the eye, and cause a considerable hardness at the upper part of the neck, near to the angle of the jaw.

The muscles of the jaw are also affected by the adhesive inflammation, and they become so rigid that it is with great difficulty the mouth can be opened.

These cases require the utmost attention, for a large abscess is usually formed, which, if left to itself, generally points externally; the ulceration extends through the substance of the cheek, there producing a most troublesome sore, which, when healed, leaves a deforming scar. To prevent these sad consequences, when the matter is formed, a free opening should be made, on the inside of the cheek, into the softest part of the tumor.

A common notion exists, that it is extremely dangerous to extract a tooth at the time the gum is inflamed; but this is erroneous. Certainly, at this time, the operation is attended with rather more pain than at another; but, as the carious tooth is the

cause of all the disease, the removal of it is the most certain, and always the most speedy, mode of cure.

In those cases where the mouth is closed, as this practice cannot be adopted, we must wait until the inflammation be sufficiently subsided for the mouth to be opened.

When inflammation and swelling of the gums and face arise from a carious tooth, they seldom subside without going into the suppurative stage. I have frequently attempted by leeches, cold applications, &c. to prevent suppuration, but have rarely succeeded: the progress of inflammation having been by these means only retarded, not prevented; for, after a certain time, it has come on with redoubled violence, and has gone through its progress: on this account, whenever there is any considerable swelling, and the patient too timid to submit to the extraction of the tooth, or if the mouth be so much contracted that the instrument cannot be conveyed into it, I think it advisable to hasten the suppurative process by fomentations, &c. and as soon as a soft place can be felt on the inside of the cheek, to introduce a lancet, and discharge the matter. People very often continue poulticing a swelling of this kind, in order, as they term it, to bring it to a head; in so doing, they cause ulceration to take place through the substance of the cheek. If the tooth produc-

ing the abscess be situated in the upper jaw, it will discharge in the middle of the cheek; if in the lower jaw, the opening will be at the lower part of the jaw, either near the angle, or at the edge of its base.

These abscesses are rarely healed; the painful symptoms may subside, but the opening remains fistulous, attended with a consequent discharge of matter.

I have known persons persist in their attempts to heal these kinds of abscesses for some months. One lady continued the application of dressings and lotions to a sore of this kind for two years, but with no benefit.

In all these cases, the fangs of the teeth become very much diseased, and are the cause of the perpetual discharge; therefore, no cure of these abscesses can be expected without the extraction of the tooth.

In these cases, at the opening where the matter was discharged, the skin rises and acquires a sort of fungous appearance, being very red, and of a loose, spongy texture; when the tooth has been extracted, the discharge gradually diminishes, and the external opening closes; but, as the inner part of the integu-

ments have been destroyed by the ulcerative process, in healing the skin becomes contracted, and a deep scar or pit remains.

From the situation and appearance of these scars, they are liable to be attributed, by superficial observers, to the effects of scrofula, which, to a female, or a person of nice feelings, is always a source of uneasiness.

When teeth, which have caused abscesses of this kind, are extracted, the fangs are found covered with a fleshy substance, which are granulations extending to the bottom of the socket; this being only an effort of nature to effect the healing process, and to fill up the cavity occasioned by that absorption of substance, which always attends the formation of matter.

When unfortunately the patient is so much under the influence of fear, that neither acute pain nor protracted suffering is sufficient to induce submission to the extraction of the tooth, the inflammation of the jaw bone is often so great as to terminate in the mortification of a large portion of its substance.

The process of exfoliation is necessarily a tedious one, the patient is in a continual state of uneasiness, and the mouth is constantly filled with an offensive discharge. As the process of

separating the dead portion of the jaw from the living advances, the gums gradually recede from the alveolar processes; at length the dead bone begins to separate, it gradually becomes loose, and, when it is completely separated from the bony attachment, it may be taken away.

In Plate I. are two specimens of the mortification of portions of the jaw bone, in consequence of carious teeth,

Fig. 8 represents a portion of the superior maxillary bone, containing a central and lateral incisor, and the cuspidatus of the left side: this case occurred to a gentleman whose lateral incisor was decayed, he had pain for a day or two, when his gums and lip became swollen; in this state, instead of taking proper advice, he poulticed and fomented his face for several days in succession: a considerable quantity of matter formed, and discharged itself under the lip; in this state it continued for some time; when he applied to me, I found that not only the diseased tooth was loose, but also the one on each side. I extracted the carious tooth, but found the socket quite rough, arising from the destruction of the periosteum. I told him I expected that the socket of this tooth would exfoliate; a short time afterwards I saw him again, when, on touching the other teeth, I perceived a motion under the gums, through the extent of the three teeth.

Some weeks after, the whole became so loose, that a slight force brought it away. The parts then healed, but not without leaving an immense cavity.

Fig. 9 exhibits a similar case, which occurred to a young lady, a patient of Mr. Williams, in the Borough of Southwark.

This lady was tormented by the tooth-ache for a long period, her face swelled, and matter formed; but all the entreaties of Mr. Williams, and the dreadful consequences which he taught her to expect, could not raise in her mind sufficient courage to permit the tooth to be extracted. The consequence was, that a large piece of the jaw mortified, the bicuspides, in consequence of their attachment to the bone being destroyed by the ulcerative process, became loose, and, being single-fanged teeth, were easily taken away; at length the piece of bone was so completely detached, as to allow of its removal, bringing away with it the diseased tooth: at this time, the second molaris, having lost almost the whole of its support, was found to be so loose as to render it necessary to be extracted. Here is an instance where a person lost four teeth, and a large portion of the jaw, through an obstinate determination of not submitting to the extraction of the originally-diseased tooth.

I saw also a woman in Bartholomew's Hospital, who, from a similar cause, lost all the teeth with the alveolar processes of the anterior part of the lower jaw.

When abscesses form in the mouths of children, from diseases of the temporary teeth, the greatest care should be taken, as, by an exfoliation of part of the jaw bone, the teeth may be destroyed.*

A knowledge of the evils which may result from a carious tooth, ought to influence all persons, who may be affected with this malady, to take such early steps for their prevention as prudence shall dictate.

Sometimes an indolent kind of inflammation will exist at the bottom of the socket of a carious tooth, occasioning a hard lump, or small tumor, of the size of half a nutmeg. In this state it will continue for months, with no other alteration than being rather sore, when, in consequence of a cold, a little active inflammation may arise.

These hard swellings should always be regarded as very dangerous, because, as during their indolent existence they have

* Vide Natural History of the Teeth, page 71.

caused a certain degree of absorption of the inner part of the integuments of the face, if any active inflammation occur, it very speedily runs on to suppuration; and, as the skin has already become thin, ulceration to the external part takes place so rapidly, that I have known an opening formed through the cheek in a very few days. On these accounts I always endeavour to persuade patients to have any tooth extracted, which may be accompanied with any hardness or swelling. It is also much better to submit to the extraction of any carious tooth which has produced an abscess; for it will be always a source of trouble, as well as occasion an offensive state of the breath.

Having described those diseases of the gums which arise from the teeth, I shall now proceed to those affections which are peculiar to the gums themselves.

OF THE SCURVY IN THE GUMS.

The most common disease of the gums, is that which has been usually called scurvy in the gums, thus denominated from assuming an appearance similar to that which happens to persons afflicted with the sea-scurvy.

This disease is generally marked by the gums becoming redder than ordinary, and enlarged from a turgescence of the vessels, which are made to bleed by the slightest causes, such as the use of a tooth-brush, the biting of a crust, or even by only sucking them.

If the complaint be not attended to in this stage, the gums become very soft and spongy, and shortly afterwards they are affected with considerable soreness, being so tender as scarcely to allow the mastication of food; this is often followed by a discharge of matter at the necks of the teeth, and an exulceration may be observed on the edges of the gums between the teeth; also those parts which form the arched appearance are soon destroyed, so that the gums have a uniform straightness, and the necks of the teeth are consequently uncovered.

This disease next proceeds to the alveolar processes, the substances of which are destroyed by absorption; at length the teeth become loose, and, in a few years, drop out, one after the other, at short intervals, until the person is rendered toothless.

It is from this complaint that many persons lose their teeth at a very early period of life; indeed, most individuals are more or less subject to it, as the gums, in some part or other, although

there be no disease of the teeth, are liable to become preternaturally red, enlarged, or tender: whenever, therefore, a tendency to this disease is observed, great care should be taken to apply such means as will arrest its progress. At its commencement it is very manageable, and may always be relieved by puncturing, with the point of a lancet, those parts which appear unnaturally red or distended. The loss of blood affords immediate relief; and whenever the slightest soreness, or an increased fulness of the gums is perceived, the above plan of scarifying the vessels will be found highly beneficial. Suppose the disease to have proceeded to that stage in which the gums become spongy or loose in texture the lancet should be then used with greater freedom. Essential service is always derived from the loss of blood; in some cases the use of leeches, as drawing away a larger quantity of blood, is attended with the best effects. Frequent recourse should be had to this treatment, which may be accompanied with the use of astringent lotions, such as the infusion of roses with the tincture of myrrh, decoction of bark, solutions of alum, arquebusade water, &c. In these cases great benefit is derived from the use of sea-water, and therefore I always recommend it, whenever it can be procured; adding, that, if the gums be tender, it should be used warm. In all cases where there is a tendency to inflammation of the gums, arising from this disease, much is to be expected from the free use of a

tooth-brnsh; at first the gums are apt to bleed a little, by which the same benefit is obtained as from the lancet: by degrees, the gums become more firm, and at length a hard brush may be used without causing any loss of blood, or giving the slightest pain.

When the gums are exceedingly tender, and have the smallest tendency to exulceration, the patient should be directed to wash the mouth very frequently with barley water sweetened with honey: in two or three days, if the soreness should be diminished, the lancet should be cautiously used, accompanied with diluted tincture of myrrh, as a wash.

If the edges of the gums do not heal under this treatment, and if they should hang loosely about the necks of the teeth, much good will be derived from the use of the *argentum nitratum* in solution. If the disease be only partial, the caustic should be applied with a camel's hair pencil dipped in the solution. This remedy appears to communicate a new action to the gums, and they generally get well in a short time. Indeed, whenever the gums are very full, and discharge a good deal of offensive matter, washing the mouth with a solution of lunar caustic is a very excellent remedy for rendering the mouth sweet and comfortable.

When this is applied to the sore edges of the gums with the hair pencil, it may be used as strong as in the proportion of a drachm to an ounce of water ; but, if the mouth be rinsed with it, it ought not to exceed the proportion of one grain to two ounces of water; because, if it get into the fauces, it is liable to produce an unpleasant nausea.

Persons who are subject to inflammation of the gums, should have them scarified whenever they become painful, or are more turgid than usual. By the loss of a little blood, they are instantly relieved, and the disease is thus prevented from proceeding to the extent which has been described.

In scarifying the gums, the lancet should be applied longitudinally to those parts which are situated between the teeth, because, if the gums are cut in those parts where they cover the fangs, they will, in healing, retire, and leave the necks of the teeth exposed ; whereas, if they are lanced in the angles, between the teeth, they will in healing be drawn tighter, and the teeth will eventually be strengthened.

OF PRETERNATURAL GROWTH OF THE GUMS.

Decayed teeth are sometimes the cause of deranged action in the arteries of the gums, by which they become so enlarged as to form excrescences or tumors of considerable size. These are frequently the consequence of carious stumps, and are produced in the following manner. The crown of a tooth having been removed by caries, and the stump remaining in the socket, even with the gums, if the socket do not close at the bottom, so as to cause a protrusion of the stump, it is so much wasted away, that the edges of the gums have a tendency to grow over it. When the gum has thus partially grown over a ragged stump, it is liable to become very sore and inflamed, from the constant irritation which the gum suffers from being pressed upon the sharp edge of the stump. Hence a diseased action is caused, and the gum very rapidly increases in size. I have seen an enlargement of this kind, surrounding some stumps in the lower jaw, equal to the size of a walnut. In these cases no cure can be expected whilst the cause is permitted to continue; the first thing, therefore, to be done is, to extract the stumps, which in general effects all that can be desired; the enlargement of the gums being of a soft, spongy, and fungous nature, is always reduced by the hemorrhage which attends this operation, after which, the

cause of irritation being removed, the vessels contract, and the gums acquire their natural state.

Some time since, Mr. Cooper was applied to, by a lady who had an enlargement of the gums in the lower jaw, which nearly filled up one side of the mouth; there were several decayed stumps remaining, around which this enlargement of the gums had taken place. Mr. Cooper sent her to me for the purpose of extracting the stumps, intending, when these had been removed, to extirpate the tumor. The stumps being imbedded in the gums, the operation was unavoidably attended with laceration of the excrescence, and consequently a considerable hemorrhage. A few days afterwards the tumor became very flaccid and dark coloured, it then sloughed away in large pieces, so that a cure was effected without any other operation.

Sometimes tumors arise from the gums without there being any diseased tooth, or any evident cause: these are of a much firmer texture than those above described, frequently being of the same consistence as the gums, when in a healthy state.

They are very vascular, and the treatment has always been considered as extremely troublesome: the usual mode adopted for removing them has been that of excision; this operation

has generally been attended with a great loss of blood, to stop which, as Mr. Hunter observes, "it is often necessary to apply the actual cautery, for arteries going to increased parts are themselves increased, and also become diseased, and have not the contractile power of a sound artery." A great hemorrhage from the gums, or any part of the mouth, must always be regarded as alarming, on account of the impossibility of discovering and securing any principal branch of the artery; or, if the bleeding should be from a number of small vessels, the difficulty of applying pressure with advantage is so very great, that recourse must always be had to more powerful agents. Mr. Hunter also remarks, that these excrescences are liable to grow again, after the operation of excision; and mentions, that they have been removed six times, and have as often been reproduced: which he attributes to a cancerous disposition. On these accounts, I determined some years since, that, if any cases of this kind should ever come under my care, I would attempt their removal by means of ligatures. The first case, in which I was consulted, was a lady of about forty years of age, who had several of the teeth on the right side of the upper jaw extracted when she was a young woman: about five years before I saw her, the gums, covering the jaw where the teeth had been situated, appeared to be thicker than before; they gradually increased in size until a very large tumor was formed: it had now become so large as to

affect the speech, and in other ways was extremely troublesome.

The lady was very desirous to have it removed; to effect which, without incurring the danger of hemorrhage, I employed ligatures. The basis being very broad, I passed a needle, with two ligatures, close to the jaw bone, through the substance of the tumor, half of which was then included in each ligature. The ligatures were tied just tight enough to stop the circulation; the next day there was a great deal of inflammation, which subsided in proportion as the ligatures began to produce ulceration, which on the fourth day was very considerable: new ligatures were then applied; on the sixth day these were removed and others introduced; on the eighth, one ligature came away, leaving the tumor hanging only by a small pedicle; this being cut through with a lancet, the whole was removed; the surface was then touched with some diluted nitrous acid, and the gums have ever since continued in a perfectly healthy state.

Subsequent experience has furnished me with many opportunities of removing several excrescences of a similar nature. The basis of these are generally very broad, and therefore cannot be included in a single ligature; on this account, I have commonly passed a needle, armed with two ligatures, through

the middle part of the tumour, as close to the bone as possible, and then have included half of the substance in each of the ligatures. The ulcerated process goes on here very quickly; in some cases the application of a second ligature has been quite sufficient, and in most cases it has not been necessary to make use of more than three or four ligatures.

Last summer, a lady applied to Mr. Cline, having an enlargement of the gums on one side of the upper jaw; a tumour of very large size was formed, which pressed the cheek so much out as to give the appearance of a swelled face. The teeth were still remaining, and not decayed; but the molares were so surrounded with the excrescence of the gums, that no successful attempt could be made to extirpate it until they had been removed. Mr. Cline sent the lady to me for that purpose, I extracted the farthest tooth; the hemorrhage being rather profuse, the extraction of the second was deferred; two or three weeks afterwards, I removed the second molaris; at the time the excrescence had become completely altered in form, being more dependant, and after the second tooth was extracted, it contracted at the basis, and acquired a pyriform shape; this afforded a very favourable opportunity for its removal by ligature, which Mr. Cline performed.

There are other excrescences which sometimes form upon the gums, differing in appearance from either of the former; they are soft, exceedingly red, and very liable to bleed. These originate from some diseased state of the jaw bone, and can only be cured by the removal of such disease. It has most commonly happened that surgeons have not sufficiently regarded the cause of the disease; for, simply attending to the state of the gums, they have cut off these fungous excrescences with the knife, or burnt them with caustic; but having been foiled in their various attempts, by their speedy renewal, they have considered them as cancerous, and the patient has been rendered extremely unhappy by having been thus informed.

Sometimes these fungi of the gums arise from a diseased state of the fangs of a tooth, which fangs have caused a death of part of the alveolar processes, and a consequent diseased state of the gums. In these cases, the first thing to be done is to extract the tooth more particularly connected with the disease of the gums, an opportunity is then given to examine the state of the alveolar processes; if these are found to be in any way diseased, means must be used to hasten the process of exfoliation. If, on examining with a probe, the socket should be found to be rough, or in any way denuded of its periosteum, then a dossil of lint, dipped in a weak solution of nitrous acid, should be applied two

or three times a day; this will hasten the exfoliation of the bone, and produce a cure of the gums.

The strength of this lotion should be one drop of nitrous acid to an ounce of water.

A very extraordinary case of tumour arising from the lower jaw, was admitted into Guy's Hospital on the 9th of April 1812. The patient's name Sarah Dulwich, aged 13, of a scrofulous constitution. The tumour was situated under the left cheek. It appeared first about twelve months ago as a small tumour from the gums of the lower jaw. At the time of her admission into the Hospital, the tumour was globular, and occupied the whole of the left cheek. Under the integuments it was irregular, and projected below the jaw; it extended to the cuspidatus of the right side irregularly under the tongue, which it thrust close to the right cheek. The surface was very irregular, and it felt hard in substance.

The pressure of the teeth of the upper jaw had caused a superficial ulceration, from whence there was occasionally an offensive discharge. Viewed externally it reached from the fore part of the chin, passing up by the side of the left nostril, to the edge of the left orbit, and thence round to the ear. The nose was pushed considerably to the right side,

thereby occasioning a great distortion of the countenance. In size it was nearly half that of the head. The skin over the whole surface had a slight blush on it, and the veins appeared to be considerably enlarged. She complained of pain at the back part of the tumour, and there was some suppuration from the right ear. Mastication had become very difficult and painful, in consequence of the pressure of the teeth on the left side of the upper jaw upon the tumour as it arose from the lower jaw. From the pressure of the tumour, the teeth of the left side of the upper jaw were pushed towards the opposite side of the mouth, as were also the teeth of the lower jaw. In other respects this poor girl was in good health, and had a good appetite.

Before the disease appeared, she was subject for some months to the tooth ache in the two molares of the lower jaw, which were exceedingly carious, and from the gums of which teeth this tumour sprang.

When she was first received into the Hospital the jaws were separated nearly an inch from each other by reason of the projection of the tumour from the back to the fore part of the mouth. It was with difficulty the lips could be brought together, but in the common state they separated to at least an inch and a half distance.

The tumour continues to increase rapidly, and by degrees it becomes more protruded from the mouth. The ulceration on the surface becomes much more extensive. In about six months from her admission, it had become so exceedingly enlarged as to project considerably beyond the lips, which were extended to an almost incredible degree. At this time her only mode of taking nourishment is by sucking fluids through a tube, and she is gradually becoming exceedingly emaciated.

Besides these various affections of the gums, they are subject to diseased appearances, symptomatic of constitutional disease. Children of scrofulous habits are more particularly liable to a spongy state of the gums, accompanied with great fetor of the breath; they become ulcerated so as to cause the alveolar processes and fangs of the teeth to be exposed. When this disease occurs to children, the teeth which are thus affected are only the temporary teeth, and therefore the removal of these is not attended with any permanent disadvantage. I have always considered it right, whenever any ulceration has taken place about the gums of children, to extract the teeth, and I have usually found that this plan has completely arrested the progress of the disease: at the same time the general health of the patient should not be neglected, and the appearance of

the gums must only be considered as indicative of constitutional derangement.

Fig. 1, Plate V. represents all the alveolar processes of the under jaw, which exfoliated in consequence of a neglected disease of the gums, in a child of scrofulous habit. It was given me by Mr. Goldston, surgeon, of Bath. Similar exfoliations sometimes take place in consequence of fever.

In more advanced age, the gums are also symptomatically affected: I once saw a lady, who laboured under general weakness, whose gums were so relaxed and devoid of vital energy, as to be perfectly soft, of a livid colour, and apparently quite dead. I pared off a great quantity of them, and ordered a stimulating lotion; which with attention to the general health, and change of situation, sea air, &c. effected a cure.

OF THE DISEASES

OF THE

ALVEOLAR PROCESSES.

The alveolar processes are elongations of the external and internal tables of the maxillary bones, which, being united by transverse processes, are divided into cavities called alveoli, or sockets, for containing the fangs of the teeth.

The alveolar processes are to be considered as necessarily belonging to the teeth, and not essential to the formation of the jaw bones. In the earlier part of life, they contain the rudiments of the teeth, which they accompany in their growth, and when the teeth are completely formed, they acquire a form exactly suitable to the shape of the fangs.

The alveolar cavities are lined with a vascular membrane, analogous to the periosteum in other bones; this membrane is

also attached to the fangs of the teeth, and by it the teeth are fixed in their sockets: the alveoli are larger than the fangs of the teeth they are meant to contain, as may be seen by examining a skull that has been macerated; where the membranous parts being destroyed, those teeth which have single fangs drop out, whilst the others are retained by the irregular shape of their fangs. On this account it is, that the teeth have a certain degree of motion, which is of great benefit in mastication, thereby preventing that injury which might arise from the concussion consequent on the breaking of hard substances. This motion of the teeth in their sockets, is made evident to all persons when the fangs of a tooth are inflamed; hence, many expect that the operation of extraction will be attended with little pain, and no difficulty; an error which we cannot be too careful to correct, by explaining that the looseness of the tooth is only its natural motion, now become more observable from the increased sensibility of the periosteum. This explanation leads the patient to abandon those delusive expectations, and preserves the surgeon from the imputation of having given unnecessary pain.

The alveolar processes are always sympathetically affected by all the diseases of the teeth and gums. When inflammation affects either the teeth or gums, it shortly extends to the alveolar processes; in consequence of which, an increased action of the

absorbents is induced, and the substance is removed. An absorption of the alveolar processes invariably follows a loss of the teeth, occasioned by any cause whatsoever. This may be noticed in very old persons, who have lost all their teeth; the upper jaw becomes much diminished in extent, and the roof of the mouth, instead of being arched, is rendered nearly flat; the under jaw becomes simply a thin bone covered by the gums. Thus, by the removal of the teeth and alveolar processes, a loss of substance is sustained nearly equal to an inch and a half in depth; and, when this is the case, the muscles of the lower jaw, in the endeavour to draw it against the upper, produce those characteristic marks of old age, the shortened face, the wrinkled cheek, and the projecting chin.

The alveolar processes have certain diseases peculiar to themselves, independent of affections arising from the teeth and gums. The most common disease to which they are subject, is a gradual absorption of their substance, whereby the teeth lose their support, become weak, and at length are so loosened as to drop out. This disease usually begins to show itself in persons between forty and fifty years of age; and, from its frequent occurrence without any evident cause, it would seem to be a consequence of having passed the middle period of life.

In the majority of cases in which this disease occurs, the teeth are perfectly sound, and, from numerous observations, I think I may venture to assert, that persons who have had several of their teeth affected with caries in the early part of life, are not liable to lose, by an absorption of the sockets, those which remain sound; but, where the teeth have not been affected with caries in the early part of life, persons, as they approach fifty years of age, and often much earlier, have their teeth become loose from absorption, or a wasting of the alveolar processes.

When the alveolar processes are removed by the action of the absorbents, the gums, which are supported by the alveolar processes, partake also of the disease ; thus, in the progress of the disease, as the absorption of the bony matter advances, the gums lose their attachment to the teeth, and recede in proportion to the wasting of the sockets. Hence when an absorption of the socket is taking place, the necks of the teeth become exposed, and the teeth appear to increase in length ; which circumstance has caused many persons to imagine that they are actually extended by natural growth. In this opinion, however, they are soon undeceived; for, as the disease increases, the teeth become weak, and at length, by losing their natural support, are rendered so exceedingly loose, that, in a short time, they drop out,

Sometimes this disease proceeds without the appearance of any assignable cause, the gums retain a very healthy aspect, are quite free from pain or inflammation, and yet will gradually recede, until the teeth become very loose.

The causes which more particularly produce this affection are such as occasion any continued or considerable inflammation of the gums. These are an accumulation of the tartar about the teeth, an habitual predisposition in the gums to inflammation, as happens in that disease commonly called the scurvy in the gums, or that state of them which is produced by the action of mercury.

When this disease attacks the alveolar processes in both jaws, it is generally discovered by all the teeth appearing longer, and having larger spaces between them than formerly, accompanied also with a difficulty of masticating hard substances. Soon after a person has made these remarks, he finds some one tooth become loose, occasioning much uneasiness, by preventing the use of that side of the mouth in which it is situated, and therefore its removal is determined upon. Shortly afterwards another tooth fails, and so in succession, until, in the course of eight or ten years, most of the teeth are lost.*

* Plate III. fig. 5.

In some cases of absorption of the alveolar processes, and removal of the gums, the disease causes a very peculiar appearance; the gums are very much swelled between the teeth, the fangs are uncovered irregularly, and are also quite black.*

Sometimes the alveolar processes are affected only partially, the absorption being confined to the sockets of two or three teeth only, after the loss of which there may be no appearance of the disease for a great length of time.†

When several teeth together have become loose, as is often the case with the incisors, they may be strengthened in an artificial manner, by tying or fixing them with a silk ligature, or a fine gold wire, to those neighbouring teeth, which may happen to be firm. By this operation, the loose teeth are supported and kept steady, not only giving comfort to the patient, but also arresting the progress of the disease, by removing that irritation which is kept up in the gums and sockets by the looseness of the teeth.

The treatment found to be most successful in arresting the progress of this disease, is the removal of that which may appear to be the exciting cause. If this be tartar, it should be removed; and, if there be a tendency to an habitual deposit, the person

* Plate III. fig. 6.

† Plate III. fig. 7, 8.

should be careful, by frequent attention, to prevent its accumulation. In some cases, this disease is accompanied with inflammation extending along the fangs of the teeth, giving the sensation of tension, and occasioning great uneasiness; this is relieved by scarifying the gums, a practice which should always be had recourse to, as the loss of blood, by abating the inflammation, relieves the pain, and checks the progress of the disease.

Sometimes the absorption of the alveolar processes is attended with a considerable secretion of pus, which oozes out from under the gums, at the necks of the teeth. This discharge is not only very disagreeable, but often renders the patient very unhappy. Persons thus affected, from observing, when they squeeze the gums with the finger, that matter passes out at the necks of the teeth, form an opinion, that it must produce injurious effects upon the sockets of the teeth, as well as render the breath offensive, on these accounts, they frequently squeeze the edges of the gums, and wipe the teeth, in order to remove what they consider to be so offensive and injurious. This practice, however, cannot be too strongly reprobated, as it tends to promote the very effects they so much fear. By frequently squeezing the gums, a constant irritation is kept up on the secreting surface, by which the discharge is not only rendered more copious, but also more acrid.

In these cases, nothing more should be done than to use a soft tooth-brush, night and morning, and cleanse the mouth by rinsing it with some lotion, such as decoction of Peruvian bark, the infusion of roses with tincture of myrrh or tincture of catechu, diluted arquebusade water, &c. By attending to these rules, the discharge will be moderated, and the mouth become much more comfortable.

An extraordinary change in the position of the teeth is sometimes produced by a slow and peculiar absorption of the alveolar processes. The teeth advance from the posterior to the anterior part of the mouth, and cause the incisors to become irregular; this irregularity sometimes increases, even to the entire projection of one tooth: and, if the projected tooth should become loose, and be extracted, the loss will not be perceived, as the tooth on each side has approached so near to each other. In this manner I have seen the cuspidati advance so much towards the symphysis of the jaw as not to leave sufficient space for more than two teeth.

This alteration in the position of the teeth arises from an absorption of the transverse alveolar processes, and the irregularity from the difference which exists in the form of the fangs and the crowns of the teeth; the former being much thinner

than the latter, necessarily occasion, when the fangs are approximated, a considerable irregularity in the position of the teeth. When this kind of change takes place in the teeth of the upper jaw, the incisors project so much as to be placed one over the other, and produce very great deformity*.

There is another disease of the alveolar processes frequently occurring, but which differs from the appearances already described. It rarely affects more than one tooth at the same time, and, instead of being an absorption of the socket, it is a filling up or contraction of the bottom of it, by which it becomes shortened, and the tooth consequently pushed out.

The appearance produced is an increase in the length of the tooth: the gum is not affected, but retains its natural situation. As the disease in the socket advances, the tooth continues to be protruded, until it loses so much of its support as to become loose, after which it soon drops out. The loss of the tooth is much hastened by occasionally striking against the teeth in the other jaw: a disagreeable effect is also produced in the symmetry of the mouth, by one tooth being much longer than the others. In this case, all that can be done, is to file away a portion of the lengthened tooth, so as to make it even with the others. This

* Plate III. fig 4.

operation should be performed from time to time, as the tooth continues to be protruded, which will save it from being struck by the other teeth, and obviate the deformity arising from the otherwise unavoidable irregularity*.

The alveolar processes occasionally become enlarged by *exostosis*. This sometimes takes place at that part formed by the union of the superior maxillary bones; the central incisors, from being closely situated together, become so much separated as to appear as if a tooth had been extracted. The same circumstance also sometimes occurs at the symphysis in the lower jaw†.

I once met with a case of considerable enlargement of the alveolar processes at the posterior part of the upper jaw, in which the molares were still remaining; great deformity was occasioned by the projection of the cheek. The practice adopted was to extract the teeth with the view of producing a decrease in the size of the tumor by that absorption of the alveolar processes which always follows the removal of a tooth. This proved very successful, for the tumor was not only diminished in size, but the progress of the disease was arrested.

* Plate III. fig. 1, 2. † Plate III. fig. 3.

OF THE TARTAR OF THE TEETH.

EXCEPTING the disease of caries, nothing is so destructive of the healthy condition of the mouth, or of the duration of the teeth, as the accumulation of tartar. This is an earthy substance held in solution by the saliva, and is deposited upon the teeth, as the saliva undergoes decomposition. Almost every person is subject to a formation of it in a greater or less degree; in some, the deposit is so habitual and copious, that without unremitted attention, their teeth cannot be preserved in a decent state; whereas, in others, it is so small in quantity that the least degree of care is sufficient to keep the teeth perfectly clean.

The formation of tartar is much influenced by the state of the health; for, during the continuance of any febrile complaint, in which the secretions of the whole alimentary canal are disordered, the mouth and teeth are loaded with a thick mucus;

hence there is commonly a very large accumulation: the same also is observed during confinement from any cause whatever, when there is not an opportunity of constantly cleaning the teeth: it is remarkably so in the confinement attendant on parturition.

After sleep, the teeth are usually found covered with a viscid, yellowish mucus, which, if not entirely removed by the use of a tooth-brush and washing, adheres to the teeth in those parts not subject to friction during mastication. Through neglect, this viscid mucus gradually accumulates, depositing itself in layers until it acquires a hard consistence, and sometimes a magnitude equal to that of the teeth themselves.

When the tartar is soft, it has a yellowish appearance; but as it becomes harder, it changes to a dark brown, or a black colour; in this way the teeth are rendered very disgusting to the eye, and, by its effects on the gums, a very disagreeable fetor is communicated to the breath.

In the formation of tartar about the teeth, it insinuates itself under the gums, and detaches them from the necks of the teeth; the gums are thus brought into a diseased state, are subject to inflammation and pain, and at last gradually recede from the teeth.

This state of the gums soon causes the alveolar processes to become affected, and absorption in them is induced; so that, in proportion to the increase and accumulation of tartar about the teeth, their natural support is destroyed, they become loose, and at length, by some accident, a large piece of tartar is broken off, when the tooth, being deprived of its artificial support, drops out. In like manner, the other teeth give way one after the other, until in a few years the greater number are entirely lost. Persons who lose teeth from this cause, complain that they came away perfectly sound, not considering it as the effect of their negligence; and it is but too commonly the case that nothing less than commencement of the loss of teeth induces them to pay attention either to their cleanliness or preservation.

The tartar always accumulates in greater quantity about those teeth situated near to the openings of the salivary ducts; and, in some few instances, it has been found, in no inconsiderable quantity, in the ducts themselves: hence, the inner side of the incisors in the under jaw, and the external sides of the molares in the upper jaw, are the most covered by it. If, on account of a carious tooth that may be tender, only one side of the mouth be used in eating, the teeth on the other side usually become very much incrustrated; which circumstance demonstrates that the friction of the food in mastication very much tends to cleanse the teeth.

There is another kind of tartar which collects chiefly about the teeth of young persons: it is of a dark green colour, rather resembling a stain than an earthy concretion: it is very injurious in its effects upon the teeth, as it corrodes the enamel, and disposes the teeth to become carious.

In Plate IV. are a variety of examples of accumulated tartar, showing also the manner in which it produces its injurious effects.

The deposition of tartar is an unavoidable circumstance, depending upon the effusion and decomposition of saliva; but it is in the power of most persons to keep their teeth free from an injurious accumulation, by carefully washing and brushing the teeth every morning, to remove that soft matter which is deposited during the night, and also by rinsing the mouth after meals, to cleanse them from those particles of food that may lodge about them, and which, being left in the intermediate spaces of the teeth, become changed during the night, and not only contribute much to the formation of tartar, but also produce a tainted breath.

If the constant use of a tooth-brush and water be not sufficient to keep the teeth perfectly clean, a tooth-powder may be

used, composed of some substance not possessing any chemical property which can act on the enamel, or of too hard a quality, by which it would grind it away.

Powders for this purpose may be composed of any of the finely powdered earths, or boles, or any of the testaceous powders; charcoal, finely levigated, has been recommended and much approved by many. In the formation of a tooth-powder, no ingredient ought to be used that can have any chemical action upon the enamel of the teeth; nothing more is desirable than something which will mechanically act with the brush, in taking from the teeth that inspissated mucus which forms the tartar; nor should any acid be introduced into washes, tinctures, essences, or dentifrices, for diseases of the gums, as, by their power in decomposing the enamel, the greatest injury is done to the teeth. In cases of disease, where acid remedies are necessary, persons should be careful to wash and wipe their teeth immediately after their exhibition, to prevent future injury of the teeth; for whatever renders the enamel thinner necessarily tends to the destruction of the teeth.

When tartar has collected about the teeth, it is to be taken off by means of instruments; this operation is called scaling of the teeth, which is one of the most useful and necessary for their

preservation. Much prejudice has been excited against this operation by the very injurious practice of some dentists, who apply the muriatic or vitriolic acids for the purpose either of softening the tartar, or whitening the teeth: the effect of these agents upon the teeth, is to remove the external coat of enamel by its solution, and to give to the teeth a beautiful white appearance immediately after its application. The natural polish of the enamel being thus destroyed, the surface is left rough, and the teeth soon afterwards become dark coloured from the adhesion of the colouring matter contained in the food. But, if this practice of applying the acid be not adopted, and the tartar, as it may accumulate, from time to time, be carefully removed from all parts of the teeth, the gums will be preserved in a healthy state, and absorption of the alveolar processes be entirely prevented.

The tartar, when it has been suffered to accumulate in large quantities, should be taken off cautiously, otherwise the sudden exposure of the necks of the teeth will be a cause of tenderness and pain. In such cases, a small portion of tartar should be removed at a time, beginning at the edges of the gums, which will permit them to grow up about the necks of the teeth; by this gradual procedure, a week or fortnight intervening between each operation, a very large quantity of tartar may be removed

without occasioning the slightest inconvenience: in the interim, the gums should be frequently washed with an astringent lotion.

I have seen many cases of great soreness and extensive ulceration of parts of the mouth, arising from large accumulations of tartar. A lady from the country applied to me, complaining of a sore mouth, which had baffled all the attempts made by a very skilful surgeon to heal it. The inside of her cheek was in an ulcerated state, and under the tongue, at the frænum, there was a considerable thickening, with a line of ulcerated surface. She had been in this state for more than twelve months, and could only obtain temporary relief from any application. Her teeth were covered with an immense quantity of tartar, such as described in figures 14, 15, and 16 of Plate IV. The edges of this substance, being very ragged and sharp, were continually cutting into the soft parts, that pressed against them. Sometimes a small portion would break off, when, from the new edge being very sharp, much irritation immediately ensued. I removed the tartar at intervals, in the manner above described, the sore places healed, and since that period, by an occasional removal of newly-formed tartar, her mouth has continued perfectly well.

In scaling the teeth, care should be taken to use the instruments with no greater force than is necessary to remove the

tartar, lest the enamel be scratched or injured; attention is also required to distinguish an irregular-formed tooth from the distorted shape which accumulated tartar frequently assumes; and, in teeth that are naturally yellow, not to mistake the body of the tooth for the extraneous matter upon it, a discrimination highly important, when applied to those yellow teeth, with very rough surfaces, described in the Natural History of the Teeth, page 27.

ANALYSIS OF THE TARTAR.

DEAR SIR,

The specimens of the Tartar of the Teeth, which I received from you, I have examined chemically. Previous to their analysis, I subjected a portion of them to the following experiments. I am,

DEAR SIR,

Truly yours,

W. H. PEPYS.

Artillery Place, Finsbury, Dec. 1, 1805.

TO MR. FOX.

TARTAR of the teeth, of a dirty white colour, inclining to brown, stained in parts yellow and green; spongy, porous texture, yet considerably hard; when it is detached in large pieces, exhibits the impression of the teeth on which it was deposited. The pieces which were examined were dry and free from smell. Specific gravity 1.5714.

Sulphuric acid 1.85 is immediately blackened, the substance becomes spongy and soft, but no complete solution takes place.

Nitric acid 1.12 acts in nearly a similar manner on this substance as on the teeth*. A gas which has the negative properties of nitrogene, is evolved in small bubbles, and a flocculent mass, of the form of the piece immersed, is left.

* See Natural History of the Teeth, page 92.

Solution of potash, boiled for some time upon it, had but little action; the tartar became whiter, the solution yellow; upon the addition of nitric acid to the separated solution, the colour nearly disappeared without any precipitate being formed: ammonia reproduced the yellow colour.

The flocculent substance left by dilute nitric acid, after washing off the acid, being boiled with solution of potash, was not wholly dissolved; the solution became yellow. Nitric acid being added, discharged the colour, which ammonia reproduced.

Water boiled for some time upon tartar gave no precipitate or turbid appearance on the addition of solution of tannin.

Tartar exposed to a red heat, in a silver crucible, smokes, accompanied with a greasy smell, is blackened in a similar manner to bone, and becomes more easily soluble in nitric acid, leaving a carbonaceous residuum.

The solutions of potash which have been boiled on tartar, being neutralized with nitric acid, gave no precipitate with solution of nitrate of barytes.

ANALYSIS.

Fifty grains of tartar of the teeth were placed in 400 grains of nitric acid 1.12; nitrogene gas was slightly liberated: in twenty-four hours it was diluted with two ounces of distilled water, and then filtered.

The solution was then precipitated by ammonia, and filtered; and, upon the addition of carbonate of ammonia, remained clear; the precipitate produced, being dried at 212°, weighed 40 grains, and, when ignited, it weighed 35, which were again soluble in dilute nitric acid, giving a copious precipitate with solution of acetate of lead: this precipitate, washed, dried, and exposed to a flame, urged by a blow-pipe, fused in a globule, accompanied with a bright phosphorescent appearance, and was therefore phosphate of lead.

The substance not soluble in nitric acid, was washed and dried at 212°, weighed 15 grains, and adhered firmly to the filter.

The 15 grains of the last experiment were boiled in a solution of potash for a quarter of an hour; being separated, washed and dried at 212°, weighed 9 grains.

The separated solution was of a yellow colour, the addition of nitric acid produced no precipitate, but lost colour, which was recovered by ammonia.

The 9 grains of residuum, after treatment of the potash, were placed in boiling concentrated nitric acid, by which they were completely dissolved; and, by the test of tannin, proved the cartilage to have been gelatinized.

Tartar of the teeth consists of

Phosphate of lime	-	35
Fibrina, or cartilage	-	9
Animal fat, or oil	-	3
Loss - - - -		3
		50

THE EFFECTS OF MERCURY

UPON

THE TEETH.

When mercury has been introduced into the system, certain circumstances occur which are usually regarded as criteria of its specific and constitutional action. The most evident of these are an increased discharge from the salivary glands, soreness of the mouth, and fetor of the breath. The gums become tumid and spongy, are very tender, and liable to bleed; the teeth also become loose, and cannot bear the pressure necessary for the mastication of hard substances: this loosened state of the teeth arises from the thickening of the periosteum which covers the fangs, and by which the teeth are held in the sockets; the soreness of the gums is probably occasioned by that fulness of the vessels which the peculiar action of the mercury induces. These affections of the teeth and gums generally subside soon after the use of mercury is discontinued, the teeth again become fast, and the gums acquire their natural firmness.

A common consequence of the use of mercury is, an increased action of the absorbent vessels, and there is no part on which this action is more evident than the alveolar processes. On examining these parts in persons who have died during the use of mercury, they will be found much less dense, and of a more porous texture than the bone ought to be in its sound or natural state. The use of mercury is therefore no uncommon cause of premature loss of the teeth, by inducing absorption of the alveolar processes ; this injurious consequence, arising from the use of this remedy, is now greatly obviated by the improvement adopted in its exhibition ; namely, by keeping up a longer but slighter action of it upon the system, rather than that violent one which accompanied the old practice of salivation.

Where the use of mercury is carried very far, the teeth, even during its exhibition, often become so loose as to drop out : in other constitutions, still greater mischief is experienced; there is a considerable inflammation of all the parts of the mouth, attended with great swelling and ulceration. This sometimes extends even to mortification of parts of the jaw-bones. It would not be difficult to collect cases of extensive mischief following an injudicious use of this valuable medicine; several striking examples of which have been presented to me by various surgeons of my acquaintance. In Plate V. fig. 2, is the repre-

sentation of a large piece of the anterior part of the under jaw, containing the incisors and cuspidati, which exfoliated, in consequence of a long-continued salivation.

Fig. 3 represents nearly the whole of the under jaw, which mortified and exfoliated; this person also lost almost every tooth of the upper jaw, which became loose, and dropped out.

A very similar case occurred to a patient in Guy's Hospital, who applied for advice on account of great disease in his mouth, as the consequence of a late salivation. He had an exfoliation nearly similar to the last case, and it was surprising to observe how small a deformity attended the loss of so great a part of the jaw. During the progress of the exfoliation, so large a deposit of new bone took place, around the dead portion, that it became, as it were, inclosed in a case; and, after it came away, the new bone was rounded, and the gums healed over very perfectly.

Last year I saw a most dreadful instance of the injurious consequences of an improper use of mercury, in a lady, a patient of Mr. Norris, who had just arrived from the East Indies, where she had been salivated on account of a liver complaint. She had been advised to employ so much mercury, that she was literally

poisoned, her mouth became completely ulcerated, and the whole constitution was so much affected, that she lay for some time in a state of insensibility. As she recovered, the soreness of the mouth rendered the opening of it painful and difficult; and, as the ulcers healed, so much adhesion and contraction took place at the posterior part of the mouth, that it could scarcely be opened even to admit a tea-spoon; at length, the contraction increased to that degree that she completely lost the power of opening it. On this account, she was under the necessity of receiving nutriment in the form of thick milk, soups, &c. introduced into the mouth by a large syringe, the pipe of which, being curved, was passed into the mouth through an opening formed by the loss of one of the molares. In addition to these calamities, the great inflammation which had been excited, caused the mortification of nearly the whole of the alveolar processes of both jaws. On separating the lips, a most dreadful appearance presented itself, the gums had retired from the teeth, leaving the alveolar processes uncovered, and quite black. I removed several teeth which had become loose, and in two or three places exfoliation was beginning to take place.

The constant discharge of matter made a very frequent syringing of the mouth with tincture of myrrh and water absolutely necessary, and had she not possessed a most exemplary patience

and composure of mind, she must have been completely miserable.

Some time since a man became a patient in Guy's Hospital, who had been so injudiciously treated in a course of mercury as to cause a complete ulceration of the gums and the inner surface of the cheeks and lips. The consequence of which was, that, as the process of healing advanced, so much adhesion of those parts took place, that the mouth could scarcely be opened. The man could only be relieved from this distressing situation by the dissection of the lips and part of the cheeks from the gums, which was performed by Mr. Cooper, the parts were then preserved from re-uniting by the interposition of lint, until they had perfectly healed.

During the use of mercury, when the mouth becomes affected, it should be frequently washed with a mild astringent lotion: for this purpose I have usually recommended the infusion of roses with a small quantity of alum; and, if the soreness of the mouth be very considerable, some tincture of myrrh may be added. During the exhibition of mercury, there is usually a considerable deposition of tartar about the teeth; to obviate the ill effects of which, it should always be removed, as soon as the medicine is

discontinued; the gums will then soon recover their healthy state, and material injury to the teeth be prevented.

Effects similar to those arising from the injudicious use of mercury sometimes attend that dreadful disorder, the small-pox. In the excellent museum of Mr. Heaviside are several specimens of exfoliations which have been occasioned by the deadly operation of that loathsome pestilence. The preparations which the figures 4 and 5 of Plate V. represent, have the following statement affixed to them. "This very curious exfoliation is from the under jaw of a little boy about four years old, from matter formed between the gums and the bone, after the small-pox. As soon as it became pretty loose, the whole was carefully removed, which shows itself to be the substance of the lower jaw, with some teeth in it. A small portion of the anterior part of the upper jaw also exfoliated with two of the incisor teeth and two secondary teeth."

A similar case has for some time past been under the care of Mr. Dorratt, of Bruton Street. A child had the small-pox about Christmas last: soon after the fever had abated, the mother found a tooth upon the child's pillow; other teeth soon afterwards became loose, and dropped out. After this, great

swelling of the integuments covering the face and chin, succeeded, this inflammation soon proceeded to suppuration, a great quantity of matter was discharged from the gums, which then began to retire from the jaw bones.

A large piece of bone, with several teeth, exfoliated from the upper jaw, and another piece from the under jaw; and when Mr. Dorratt gave me the account of the case, he informed me that he expected the exfoliation of another large piece.*

In page 80 of the former volume, I could not refrain from expressing the hope that this scourge of mankind would soon be driven from the world by the mild, but powerful, influence of vaccine inoculation; a triumph for humanity, which might have been achieved in our country as well as in some of the states and cities on the continent. It is a lamentable fact, that, in the country that gave birth to this glorious discovery, there should be found persons capable of taking every method to alarm the fears and excite the prejudices of the careful, but uninformed, parent; and who instead of uniting in the benevolent effort to preserve human life, have exulted at every unfavorable circumstance; and have taken advantage of those accidents which have resulted from negligence or want of information; and have

* Plate V. fig. 6, 7.

unremittingly attempted to destroy the confidence of the public in this most salutary gift of Providence.

But the attempts of these persons have only tended to confirm the success of the practice; for, while by the industrious but malignant attempt to render the small-pox epidemical, by extending its inoculation, the atmosphere of the metropolis has been for some time past impregnated with the infection, the thousands who have been satisfactorily inoculated with the vaccine have remained in perfect health, although surrounded by the most active and virulent contagion. I cannot but express the hope that the legislature will wisely interfere, and, by restricting the inoculation of the small-pox, effectually prevent these gentlemen from indulging themselves in experiments so fatal to the public welfare; but which they openly endeavour to turn to their own private emolument.

This wonderful discovery was announced in the year 1798. From our favoured isle, it was soon carried to the other nations of Europe, and to America. In Russia, by the order of the emperor, it has been diffused through his vast empire. From Vienna, it was conveyed through Persia to our possessions in the East, where it was received with enthusiasm, not only by the European settler, but by the Hindoo it was regarded as an im-

mediate gift from Heaven. Through the exertions of Mr. Ring, whose zeal in this cause must render him estimable to every philanthropist, it has been successfully conveyed to our settlements in New Holland, and there is reason to believe that it has been introduced into Africa.

Thus, like the sun, has this discovery extended its benign and life-preserving influence around the globe. What gratitude to the Almighty ought to possess the mind of him, on whom has been conferred the happiness of communicating so great a blessing to man! Long may he live,—and may the name of JENNER ever be revered as one of the great benefactors of the human race!

OF THE DISEASES

OF THE

ANTRUM MAXILLARE.

The antrum maxillare is a large sinus or cavity in the superior maxillary bone. It is situated over the molares, and under the orbitar plates: it is lined with a membrane, and has communication with the cavity of the nose by a small aperture in that part of the side of the sinus which is membranous, and which is placed between the superior and inferior turbinated bones.

Inflammation in the antrum is often cccasioned by diseases of the teeth, but it also occurs when the teeth are quite sound. Sometimes, in examining the prepared bones of the head, one or more fangs of the large molares may be found passing into the cavity. In such a case, inflammation, excited by a diseased tooth would speedily communicate to the membrane lining the cavity, and cause suppuration.

Much mischief usually follows the neglect of an abscess of the antrum. The natural opening from the cavity is usually rendered impervious, hence the matter is obliged to make its exit by an ulceration through one of its sides, which most frequently is that situated under the cheek. It is common to membranes, under inflammation, to become thickened, and as the opening into the nose is through a membranous part, it is probable that when inflammation takes place, it is in consequence of the thickening of this membrane that the opening of the antrum into the nose becomes closed.

During inflammation in the antrum, the patient at first conceives the pain to proceed from the tooth-ache; but, if the teeth should not be diseased, a more accurate observation is made upon the peculiar sensations excited. The pain usually extends towards the forehead, in the direction of the frontal sinus, and a sensation of tightness and weight, with throbbing, is felt on the side of the face. In a short time, the cheek becomes red, and appears as if swollen; it feels very hard, and, on raising the lip, a considerable fulness above the fangs of the teeth may be observed.

If the disease be not attended to in this stage, as the matter rarely passes out at that side leading into the nose, an absorption

of the bone above the molares takes place, and the matter discharges itself through the gum; but this does not cure the abscess, the formation of matter still continues, and the ulcerative process goes on, until so great a destruction of the bone is caused as to render the disease incurable.

This case requires the same kind of treatment as abscesses in general, viz. an outlet to be made for the matter: the best mode of effecting this is by extracting one of the molares, and making a perforation into the antrum, through the socket of one of the fangs. If it should happen that either the first or second molaris be carious, it will be proper to extract it; but, when the teeth are perfectly sound, the second molaris is to be preferred, as the antrum descends the most at that part, and it is desirable to have the opening in the most depending situation.

When the matter has been discharged, the object must be to restore the parts to their former condition; with this view, a solution of tincture of myrrh is to be frequently injected, with a syringe, through the opening. As the inflammation subsides, the natural opening usually becomes pervious, and the injection will pass into the nose: when this opening is restored, the discharge gradually diminishes, the gum may then be suffered to heal over the artificial opening, and a cure is effected. As there

is always a disposition in the gum to close over the part from whence a tooth has been extracted, it may be kept open, where the socket has been perforated, by introducing a piece of bougie, which sticking at the upper part of the socket, and hanging just low enough to be taken hold off, may be withdrawn at the time of syringing, and then be again returned.

If the natural opening into the nose has become perfectly obliterated, it will be requisite to preserve an artificial one; this may be accomplished by wearing a silver tube in the perforated part, through which the mucus will constantly pass into the mouth, and future accumulations be prevented.

I have met with several cases of disease in the antrum, occasioned by carious stumps, in which a considerable enlargement, with absorption of some of the anterior part of the bone had taken place. The extraction of these stumps has been followed by a great discharge of a glareous fluid: from the socket the discharge continues for some time, but it gradually diminishes until the part acquires a healthy state.

The antrum is sometimes the seat of formidable diseases, but these cases are not common. That which most frequently occurs is the formation of a polypus, or fungous tumor, within the cavity.

The usual progress of this malady is, that the tumor having acquired a certain size, an absorption of the bone is induced by the pressure, this absorption commences in the internal part of the cavity, which is gradually rendered thin, until the whole is completely removed. The alveolar processes and even part of the fangs of the teeth are absorbed, when the remainder of the teeth, becoming loose, irritate the gum, and must be extracted*. The tumor continuing to increase, the cheek becomes much enlarged, and, instead of bone or fungous substance, occupies the whole side of the face; at length ulceration takes place in some part, which, as it increases, is attended with so considerable a discharge of matter, that the strength of the patient is gradually diminished, and at length the disease terminates fatally.

The antrum is sometimes most dreadfully affected with cancerous disease. Happily these cases are very rare; the only specimens that I have seen are in the possession of Mr. Heaviside and Mr. Taunton. The histories of these cases are very similar, the patients were both elderly women; at first they complained of pain in the side of the face, extending up to the forehead and the eye, and back to the ear; these symptoms continued for about four months, when a tumor formed near the ear, from which, shortly afterwards, there was a discharge of a

* Plate II. fig. 17.

very fetid, dark-coloured fluid. Ulceration then began in the cheek, over the maxillary bone, by which, after great ravages had been committed, their strength was gradually exhausted, until death terminated their sufferings. These cases were about fourteen months in their progress.

In the patient under Mr. Taunton's care, the disease, which was on the right side, occasioned the absorption of the *os maxillare superius*, the *os palati*, the *os malæ*, the *os unguis*, and the condyloid and coronoid processes of the *os maxillare inferius;* also there was an opening of communication from the orbit to the *dura mater* by an absorption of part of the *os sphenoides* and of the *os frontis;* but the *dura mater* was not injured.

In Mr. Heaviside's museum is the scull of a woman who had a disease of the antrum, attended with a very great enlargement: in the course of the disease, an ossification in the substance of the tumor took place. Mr. Heaviside, who very kindly favoured me with drawings from which the Plate VI. and fig. 1, Plate VII. were engraved, is not in possession of any accurate history of the case. It occupied, in its progress, about five years. When it had existed about four years, matter began to form under the skin of the face, which, ulcerating, was

attended with a great discharge, under which the patient finally sunk.

A few years since I had the opportunity of observing the progress of an antrum case, in a respectable gentleman, Mr. W. The disease first exhibited itself as a tumour above the molares, occasioning a slight prominence of the cheek. By the direction of Mr. Cline, about once a fortnight I made an incision with a lancet into the tumour, which being attended with a considerable hemorrhage, greatly diminished the tension which arose from the fulness of the vessels.

As the tumour increased, an absorption of the maxillary bone took place, together with the fangs of the teeth,* which becoming loose, were extracted. At length the tumour became so enlarged as nearly to fill the mouth, and by its projecting of the cheek, greatly deformed the countenance. By adhering to the occasional use of the lancet, the disease was retarded in its progress for about five years, when ulceration commenced, by the distressing effects of which the life of the sufferer was terminated in a few months.

* Plate II. fig. 17.

Mr. Cooper is in possession of a remarkable case of ossification from both antra: a tumour projected from each antrum, which, by their gradual enlargement, effected such a change in the structure of the orbits, that the eyes considerably projected; at length the ossification proceeded upwards, and produced so much pressure upon the brain as to be the cause of the death of the patient.

OF IMPERFECTIONS

IN THE

PALATE.

Defects, from incompleteness in the natural structure, are sometimes met with in the palate, or roof of the mouth. There is much variety in these defects; in some there is a deficiency of the *velum pendulum palati*, or soft palate; in others, there is a fissure extending through the whole roof of the mouth, both the bony and soft parts being divided. These extensive natural imperfections can rarely be assisted by artificial palates. It is certainly very desirable to cover the opening, and thus contribute to the comfort of the patient, by preventing the passage of food into the cavity of the nose, and also by rendering the sound of the voice more articulate. But the irritation is so great in those cases where the soft palate is deficient, that in general all artificial means are inadmissible; and whenever the experiment is made, it should be accompanied with expectations of failure. Artificial palates must be confined

either by attachments to the teeth, or to the sides of the fissure itself; if the teeth have not acquired their full strength, the necessary fastenings will produce their premature loss; and, if the attachment be made to the sides of the fissure, there is great danger of increasing the defect by widening the opening, or of preventing such a degree of contraction as nature herself might effect.

Sometimes fissures in the palate are connected with hare lip; when this happens, the jaw-bone is commonly distorted, and much projected. In Plate VII. is the representation of an extraordinary case that came under the care of Mr. Heaviside. It was in a young gentleman born with a double hare lip; the upper jaw-bone also projected considerably under the nose. When the time of dentition arrived, three teeth came in this projecting piece, and the appearance of the mouth was as in fig. 1. At the time that Mr. Heaviside was first consulted, he advised that no operation should be attempted until the young gentleman had arrived at an age when the success of the operation would have no chance of defeat from childish resistance. When he was about six years of age, Mr. Heaviside began to perform the operation; at that time he dissected from the bone a piece of skin which grew upon the upper surface; he then sawed off the projecting piece, with three teeth in it, fig. 2. Twelve months

afterwards, he performed the operation for the hare lip on one side. He then left his patient for another year, when he performed the like operation on the other side. The piece of skin that had been attached to the upper surface of the bone, formed the central portion of the lip; and, when the cure was completed, the face appeared as in fig. 3, having a most perfect symmetry, and free from any deformity.

The bones of the palate are often affected by the secondary symptoms of lues, and considerable exfoliations are produced. Sometimes a large portion of the bony palate, together with the alveolar processes, and several of the front teeth, are lost. These defects can generally be remedied with success. If there be simply an opening through the palate, a thin plate of gold may be formed so as perfectly to cover it, and it may be secured either to the teeth or the sides of the orifice. If there should be a loss of teeth, combined with a defect in the palate, artificial teeth, having a false palate connected with them, may be so constructed as to restore the patient to his former appearance, and capability of distinct articulation.

In applying a remedy to defects of the palate, difficulty seldom occurs, excepting in those cases where there is a loss of the *velum pendulum palati:* the extreme irritability of the parts con-

nected with it renders a successful use of any substitute, however ingeniously contrived, very doubtful, on account of the irritation which is often brought on by any foreign substance touching the posterior part of the tongue or fauces.

The *ossa palati* are sometimes subject to *exostosis*, by which the arched form of the roof of the mouth is destroyed*. I once saw a case of cartilaginous substance, which formed in the roof of the mouth of a young lady, and which was dissected out by Mr. Abernethy.

* Plate V. fig. 8.

OF ARTIFICIAL TEETH.

Upon this subject, I cannot attempt to do more than give a very general statement, it being impossible to teach a mechanical art in any other way than by manual practice.

The inconvenience which attends the loss of teeth, in respect to enunciation, as well as mastication, renders the introduction of some substitute very desirable. For this purpose artificial teeth are invented, which not only remedy the effects above-mentioned, but also preserve the symmetry of the mouth.

Artificial teeth are most commonly formed from the tooth of the hippopotamus, which is the most dense osseous substance with which we are acquainted. Of late years, they have also been made of a porcelain composition, which has been introduced by M. de Chemant: this gentleman's invention merits much commendation, as it affords a more durable substance for those,

who, from acidity, or some peculiar property in the fluids of the mouth, destroy artificial teeth, made of osseous substances. However, these teeth do not sufficiently resemble nature, and considerable allowance must be given to the statements of an author disposed to regard his own invention as meriting a decided preference.

The manufacture of artificial teeth requires a proficiency in mechanical art which can only be acquired by much patient labour, and it is the exactness with which they are adapted to the mouth, and the ease with which they can be worn, that constitute their chief excellence. In order to be able to prepare an artificial tooth, a model of the space to be filled up must be taken in wax; from which a cast in plaster of Paris may be made. The impression of the mouth in the wax being the reverse, will cause the plaster of Paris to acquire the exact representation of the person's mouth. Having thus obtained a model, the substance designed to be the artificial tooth must be fitted with great nicety, and be so formed as to correspond with the other teeth. The same general directions apply to the formation of more teeth than one, and so even to a complete set.

Artificial teeth are made secure by fastening them to the adjoining teeth by ligatures of silk, Indian weed, commonly called silk-worm gut, or fine gold wire. If the teeth are made to fit

very correctly, a slight fastening will be sufficient; and, in all cases, persons should avoid tying ligatures very tightly, as then they are very liable to create pain, and do mischief. In other instances, they are fastened by means of gold springs.

The foregoing remarks apply only to those cases in which the teeth have been extracted, or being loose, have dropt out: but, when teeth are lost by caries, another mode of inserting artificial teeth is adopted.

The incisors and cuspidati of the upper jaw are very frequently affected with caries, and the crowns of the teeth decay, so as to leave little more than the fangs in the sockets. When the teeth are in this situation, if there be no disease in the socket, new teeth may be fixed to the fangs of the decayed ones, without any attachment to other teeth being required. This operation is to be performed as follows. All the ragged or carious remains of the crown of the tooth are to be filed away close to the gum; the hole in the fang, which forms the natural cavity, is then to be prepared for receiving the pivot, by which the new tooth is to be fastened; this is done by passing a small instrument, called a broach, into the cavity, and drilling it into a smooth, round hole. The fang being thus prepared, the crown of a human tooth, corresponding with the one that has been filed off, is to be fitted

to the fang, a hole is then to be drilled, and a piece of gold wire screwed firmly into it; the wire being left of a length equal to the hole in the fang, and filed to the exact size, is to be introduced, and, being made tight, it may continue for many years without occasioning any trouble, or requiring any repair. In this mode, several teeth belonging to the same person may be replaced, which cannot be discerned upon the most minute inspection.

Much prejudice has been excited, without foundation, against the use of human teeth, in the manner as above described, on account of various alarming symptoms having attended the former practice of transplanting. No person can be a greater enemy to that operation than myself, but there is a most essential difference between the two modes of practice; for, in that which is recommended, we only use a piece of a tooth, which may be considered precisely in the same condition as any common piece of bone. No tooth formed by art can be compared with a natural tooth, fixed in this manner; as artificial teeth must differ, in some degree, from human teeth, both in colour and form.

Natural teeth connected to a plate of gold, or a base made of the tooth of the hippopotamus, may be fixed in the same manner as artificial teeth. This is a very neat mode of supplying the loss

of teeth, and cannot be detected, by any difference in their colour or form, from the natural set.

It was Mr. Hunter who introduced and recommended the practice of transplanting teeth; and, under his immediate inspection, it was carried on to a great extent. In his treatise on the diseases of the teeth, he goes into the subject at great length, and he admits it to be a difficult, uncertain, and often an unsuccessful operation.

In the course of the practice, many very disagreeable and alarming symptoms attended some of the cases. In a later work, Mr. Hunter endeavoured to diminish the disrepute into which a practice had fallen that he was naturally partial to, from its being of his own invention, by accounting for all the symptoms which occurred, on the principal of irritation exciting deranged sympathies. That the mere irritation of a foreign body, as the tooth of one person inserted into the alveolus of another, will occasion many extraordinary sympathies, independent of any infection, may readily be conceived. I have been informed by Dr. Jenner of a person who had blotches on the skin, from the irritation which followed the replacing of a tooth into the same socket from which it had been extracted.

However, the ill success and unfortunate consequences that sometimes occurred, have caused the practice to be abandoned for many years past. The other modes of supplying the loss of teeth are so unexceptionable, and invariably successful, that we have no reason to regret the failure of the practice of transplanting. I might indeed have observed, that this operation involved in it a defect of the moral principle, as one person is injured and disfigured, in order to contribute to the luxury and convenience of another.

In Plate II, fig. 18, is the representation of a transplanted tooth, which was worn by a gentleman for eleven years: it had never been quite fast, but, during the last two or three years, it had become very loose; at length the crown broke off, and left the fang in the gum: on extracting it, I found it to have been absorbed all around, in the most curious manner, and contrary to the common mode in which the absorbents act upon the fangs of teeth, which is to begin at the point, and extend towards the neck. In this way, the absorbents, as if conscious that this tooth was an intruder, exerted their utmost power in order to eat it out, rather than permit its continuance.

OF THE

MANNER OF PERFORMING SOME OPERATIONS

UPON THE

TEETH.

In the course of the different sections of this work, mention has been made of the propriety of performing certain operations: I did not consider it proper to interrupt the history of a disease, by describing the mode of performing any operation which might be recommended, but reserved it for a separate section.

OF FILING THE TEETH.

The application of a file to the teeth is considered by some persons, as one of the most injurious practices which can be performed; and they think that the decay of the tooth will certainly follow the removal of the least portion of enamel. These opinions have been disseminated by certain empirics, who have considered diseases of the teeth as a source of profit, and have

therefore, paid no regard to the correctness of their statements, provided that they could acquire gain.

In those cases of caries where filing has been recommended to retard its progress, the most decided advantages were promised ; and it is a practice defensible on the most just principles. Caries is a disease which it is not in our power entirely to arrest by any remedy whatsoever: its progress is gradual, but certain, until the destruction of the tooth is effected. The only plan that promises success, is to remove the carious part from that which is sound, with the expectation that the disease will thereby be stopped. This theory is justified by the success of the practice, whenever it is adopted before the caries have reached the internal cavity of the tooth.

The decay of a tooth is never occasioned by the loss of a part of the enamel, provided it be superficial, and not entering the cavity : this is frequently seen in those cases where a piece of a tooth has been broken off, and caries has not been produced. In like manner, a considerable portion of a tooth may be filed away and the remainder will continue perfectly sound.

These facts may be well illustrated by stating the customs of some savage nations ; these people have many customs, in which

doing something to the teeth forms an essential part of the ceremony. In New Holland, the beating out one of the lateral incisors is performed by the priest, when a youth has gone through various ceremonies previous to his being introduced into the class of warriors. In one of the tribes of New Zealand, the queen is distinguished by having a piece of gold substituted for her two front teeth. Upon the effects of filing the teeth, the Abyssinian Negroes and the Malay Indians furnish striking examples. The Abyssinian Negroes have a method of cutting off the corners of the cutting edges of the incisors in both jaws, in order to make them all into pointed teeth; this operation they perform without entering any part of the cavity.* Mr. Cline was in possession of a scull of one of these Negroes, in which, although it bore the marks of having belonged to a man who had been somewhat advanced in years, the teeth, thus filed, were not in the least rendered carious. A most convincing proof that the mere filing of a tooth does not cause it to decay. The other example in the custom of the Malay Indians, consists in filing the incisors of the upper jaw, in a direction across the upper part of the anterior surface, so as to give them the appearance of being fluted. By this mode of filing the teeth, the enamel is not only removed, but the cavities in the teeth are more or less exposed: the consequence of this is, that the teeth soon become carious. I had an opportunity, some time back, of examining the teeth of three

* Plate VII. fig. 5.

of these men: they were all filed as represented in Plate VII. fig. 4. In those teeth which had the cavities exposed, caries had taken place, and those remained sound from which little more than the enamel had been taken off. These facts demonstrate that the teeth are not rendered carious by filing, excepting when any part of the cavity is exposed.

The incisors of the upper jaw, as I have already shown, are very liable to become carious, in consequence of being crowded, or pressed much against each other. To prevent this disease from taking place, it is advisable to make a separation between each tooth with a very thin file; and the space ought not to be wider than to allow a piece of paper, or fine linen, to be passed between the teeth. If the teeth have begun to be carious, a wider space should be made. In case one tooth should be carious, and the next to it perfectly sound, then the file should be smooth on one side, which will save the sound tooth from being injured.

Sometimes there is so much sensibility in the teeth, that filing causes pain; here it will be proper to file but a little at a time, until the decayed part is removed. If the decay appear to have entered the cavity of a tooth, it will be advisable not to touch it with the file. In that disease of the alveolar processes, where the teeth are protruded from the socket, the tooth should be

made firm to the side teeth, by means of a ligature, previous to making use of the file; the projecting piece may then be filed off without causing any disagreeable jar or shaking of the tooth. In filing off the ragged points of broken teeth, no other direction is required than not to make use of a coarse file; fine Lancashire files are the most proper for all these purposes.

OF STOPPING THE TEETH.

It frequently happens that persons apply to have this operation performed, with an expectation that it will relieve the tooth-ache: the error of this opinion will appear, when it is considered that tooth-ache, being a consequence of inflammation, can only be relieved by such applications as diminish increased action. The cavity of an inflamed tooth is commonly so very sensible, that even the accidental entrance of any substance will cause the most acute pain; hence an endeavour to fill up the cavity of a tender tooth, with any material that requires pressure, would increase all those sufferings from which it is the desire of the patient to be relieved. A tooth then can only be stopped when it is perfectly free from pain or tenderness.

By stopping a tooth, it is rendered artificially sound again. The carious cavity being completely filled up, the introduction

of particles of food, and that taint of the breath which arises from their becoming putrid, are prevented; the nervous membrane, in the natural cavity, is preserved from being irritated, and is rendered less susceptible of changes of temperature in the articles of food; and, if care be taken to keep the stopping in a complete state, the progress of decay is very much retarded, and the tooth ache almost certainly prevented. I am acquainted with persons who have had carious teeth for several years, but who have never felt the tooth-ache, from keeping the cavities in their teeth constantly stopped.

In stopping a tooth, the first thing to be done is to clean the cavity from all extraneous matter, and to wipe it out dry; then a piece of gold or tin-foil leaf is to be introduced, and carefully and firmly pressed in, so as completely to fill up the cavity. The superfluous parts are then to be cut away, so as to allow the mouth to be closed without pressing forcibly upon it; the stopping is then to be polished, and, being left quite smooth, it will not in any way incommode the tongue.

A decay in the central part of the teeth is the most favourable situation for retaining the stopping; when it is in the sides, or between the teeth, the pressure of the food is liable to displace it, and therefore it requires frequent renewal.

Instruments for stopping the teeth are usually placed in the case of scaling instruments: they consist of a hook for picking extraneous substances out of the cavity, a straight and a curved instrument for pushing the stopping into the tooth, and an instrument with a bulbous-formed end, to be used as a burnisher in polishing the surface of the stopping.

A new method of stopping the teeth has been recommended to me by some chemical gentlemen, which promises to be very successful in all cases where the tooth is not tender, and the caries is situated in the centre. The composition for this purpose is made of bismuth, eight parts; lead, five parts; and tin, three parts; a heat of the temperature of boiling water is sufficient to melt it, hence it is called the fusible metal. The cavity in the tooth, being wiped perfectly dry, may be stopped by pouring a drop of this metal into it, when it instantly becomes solid, and as, in cooling, it strikes into all the irregularities of the carious part, it is a most perfect mode of filling it up.

The MODE of APPLYING LIGATURES to the TEETH.

Mention has been made of applying a ligature to the teeth, in order to strengthen them artificially, or to assist them in becoming fast again after they have been loosened by a blow, or by

absorption of the alveolar processes, or by the accumulation of tartar.

Silk is the best substance for the various purposes of ligatures for the teeth; it is manufactured in a peculiar manner, and kept in the shops under the name of dentist-silk.

The manner of applying a ligature is, first to pass the silk around a strong tooth, and to tie it with a single knot, between the sides of the teeth, that it shall not occasion inconvenience: then to bring the ends around the next tooth, and tie a knot in like manner. If there be but one loose tooth, the ligature is to be applied to the strong one on each side, and to include the weak one; but, if there be several weak teeth, the ligature is first to be tied to a strong tooth, and then, after having included, in succession, all the loose ones, a double knot is to be made on the next strong tooth. A ligature, applied in this way, often remains without breaking for a considerable time, and is worn with great comfort, the weak teeth are supported, and, being kept steady, are prevented from being troublesome, and their final loss is much retarded. Whenever the ligature breaks in any part, the whole must be removed, and a new one replaced.

OF SCALING THE TEETH.

By the term scaling the teeth, nothing more is meant than the removal of the tartar; though, through prejudice, a popular notion prevails, that, by scaling the teeth, a removal of the enamel is intended. The instruments for performing this operation are made of various forms, so adapted, as to be easily used on the different parts of the teeth. The most conveniently formed set of instruments consists of, one having the shape of a chisel, a straight and a curved spear-pointed instrument; one like a rugine, being three pointed, and adapted for scraping; and another formed for scraping, but smooth at the back. In some sets, there may be one or more instruments of different shapes; but this depends more upon caprice than real utility, as it is not so much the form of an instrument that is of consequence, as the proper manner of using it.

The patient should be seated in a chair, having a high back, that the head may rest conveniently; and, by being kept steady allow the operation to be performed with convenience to the surgeon, and ease to the patient. Endeavours should be made to acquire a habit of taking off the tartar without violence, operating with as light a hand as possible.

The chisel-formed and straight spear-pointed instruments are designed for the anterior surface of the under incisors; the curved spear-pointed and the scraping instrument with a smooth back, for the outer side of the molares and other teeth; and the three-pointed instrument, or other scraping instruments for the posterior surfaces of the teeth. By attending to these hints, with a little practice, a habit may soon be acquired of removing the tartar without leaning heavily upon the mouth, or jarring the teeth, which are two circumstances of considerable importance.

OF EXTRACTION OF THE TEETH.

FEW operations in the ordinary practice of medical men, are more repugnant to their own feelings, as well as to those of their patients, than the extraction of a tooth. In this operation, both surgeon and patient are frequently alike influenced, as it often happens that the former is quite as much averse from performing the operation as the latter is from suffering it. This reluctance in the surgeon can only arise from deficiency of confidence in his own abilities, producing fear lest he should perform the operation unsuccessfully. I shall, therefore, offer a few hints, which may tend to remove distrust, and, in this way, increase the fortitude of a timid operator.

The various conditions of the teeth, which may create necessity for their extraction, produce equally great variety in the difficulty or ease with which the operation may be performed. In some, the teeth are so loose, that they may almost be taken

away by the fingers; in others, from the carious state of the teeth, or from the direction and strength of the fangs, it is impossible to succeed, notwithstanding the greatest care or ability.

Extraction of the teeth is required for the following reasons; in children, to prevent or remedy irregularity in the arrangement of the permanent teeth, and on account of tooth-ache arising from caries of the molares, which is a very common circumstance. In adults, from the teeth having become loosened from an absorption of the alveolar processes; or from some other cause, as the effects of caries.

It would be useless to mention the great variety of forms in which instruments for extracting the teeth have been made: I shall only describe such as are really useful, and make a few remarks on some that have been strongly recommended.

The key instrument, or, as it has been commonly called, the German key, is the most useful: it has undergone several alterations in form, and has received some improvements, which, I think, have brought it as near to perfection as possible. The first material improvement in this instrument was made by Mr. Spence: it consisted in adding a projecting part at the end of the bolster, through which the screw is passed. This addition was

made for the purpose of fixing a claw, in an advanced position, beyond the bolster, which was found extremely useful in the extraction of the *dentes sapientiæ*.

Mr. Savigny introduced his improved key with a round bolster, and a raised form in the stem of the instrument, which is very convenient for avoiding injury to the front teeth, when it may be required to extract a tooth, by fixing the bolster on the inner side of the jaw. It occurred to me that another addition was still requisite to make it complete, and that was, to be able to fix a claw behind the bolster, that it might act on a principle similar to Mr. Spence's improvement, which is, to have the fulcrum of the instrument applied at a different place from the carious tooth to be extracted. In Mr. Spence's instrument, the claw is placed before the fulcrum, in mine the fulcrum is placed before the claw. This improvement I have found of very essential service in extracting the biscuspides of the lower jaw, and also in cases were a large gum-boil, of extreme sensibility, happened to be situated at the part where the fulcrum of the common instrument would have been placed; a circumstance of great utility, as the pressure may be made upon an insensible, rather than upon an inflamed part. The descriptions in Plate VII. will clearly illustrate the above statement. The alterations in this instrument, from Mr. Savigny's improved key, which had

the advantage of Mr. Spence's improvement, consist in a place for fixing the claw behind the fulcrum, and in having the bolster of an oval form instead of a round one, as the latter occupies too much room in the mouth. This instrument is applicable to the extraction of the bicuspides and molares.

For the removal of the molares of children, a small spring key instrument is very requisite. In operating upon a child, nothing ought to be exhibited that might occasion alarm: a very small instrument may be hidden in the hand, which, by preventing terror in the child, will produce submission to the operation: this small key instrument may be accommodated to the handle of the large one.

Sometimes it happens that a molaris on each side of the mouth occasions tooth-ache at the same moment, in which case, it is desirable to remove both of them; but there is great difficulty, after a child has felt the pain from the extraction of one tooth, to persuade it to submit to a second operation: on this account we must always endeavour to be as quick as possible. It is very easy, when the mouth is open, to extract more than one tooth, as the claw of a spring key can be turned in so short a time that the little patient scarcely knows any thing about it. Parents are too solicitous to prepare the minds of their children for under-

going the extraction of a tooth, by talking of it, and assuring them that they will not be hurt, &c. &c. but I have usually observed that attempts of this kind are often unsuccessful, and the contrary disposition is more generally excited. The best plan is not to mention to the child any intention of having its tooth extracted, but only to allow the time for performing the operation to be the moment of deliberation. Children are often tortured with the anticipation for several days together, and, when the moment arrives, they have lost all their fortitude.

For the extraction of the incisors in the adult, and the incisors and loose molares in children, an instrument is used, called the paces: this instrument is an improvement upon the crow's-bill, formerly used. The form recommended by Dr. Blake, of Dublin, is the best; they are made straight and curved. The instrument for adult teeth should be larger and stronger than that for the temporary teeth. For the extraction of a stump, the instrument commonly called a punch is employed. Besides these instruments, a pair of forceps, like the common dressing forceps, but rather stronger, are required for the purpose of removing a loosened stump, or any small splinter.

Some persons have very strongly recommended instruments adapted for the perpendicular extraction of teeth: much ingenu-

ity, indeed, has been exercised in the construction of all these; but they are not applicable to general use. The principle on which they all act is this; that, after having fixed the extracting instrument on the carious tooth, a powerful action is made with it, and the tooth is removed, just on the same principle as that by which a cork is drawn from a bottle by the patent corkscrew. There are several insurmountable objections to this mode of extraction: in the first place, the instruments being of complicated structure, they cannot be used quickly, a circumstance of the greatest importance: secondly, it not unfrequently happens that the tooth to be extracted is much stronger than the tooth on which the counter pressure is to be made; here the sound tooth is much injured, and the carious one cannot be extracted: thirdly, the fangs of some teeth being very divergent, it is not possible to extract them in a perpendicular direction, any more than a piece of wood, dove-tailed in a mortise, can be removed in any other way than in a lateral direction: fourthly, there may be no teeth remaining on which the counter pressure can be made. In trying these instruments, I have met with all these various difficulties, and, therefore, think them inapplicable to general use.

I shall now state the manner of extracting the different classes of teeth, accompanied with cautions necessary to be observed under different circumstances.

Previously to the extraction of a tooth, it is very necessary that the gum should be separated as much as possible from the neck of the tooth and the edges of the alveolar processes. This is to be done with a gum lancet, and a round edged one is to be preferred to a pointed one. The lancing the gum saves it from being torn by the raising of the tooth, and the claw of the instrument can be pushed so much under the gum as to obtain a firmer hold upon the neck of the tooth. In young children, we may dispense with the lancing of the gum, on account of their extreme timidity ; beside, as their teeth are commonly not very strong in the sockets, there is very little danger of injuring the gums.

The incisors and cuspidati, although very subject to caries, are not frequently affected with tooth-ache, therefore it is not often required to extract them on that account. In the loose state, they are easily removed, and the paces have commonly been used ; but, when firm in the head, it has been usual to employ the key instrument. There are two or three objections, however, to this practice : it must be recollected that the fangs of these teeth are long, and the alveolar processes thin ; it is, therefore, almost impossible to extract an incisor or a cuspidatus with a key instrument, without splitting up the alveolar processes. This accident, together with the unavoidable contusion

of the gum, occasioned by the pressure of the instrument, leaves an unpleasant ulcer, which, being in the front of the mouth, is very perceptible, and as it is a considerable time in healing, the patient often expresses much dissatisfaction; there is also a danger of breaking the tooth in the middle of the fang, especially in the case of the cuspidati. These accidents are avoided by making use of the paces; and, as these teeth are straight, and have conical fangs, they may be extracted in the direction of the socket, which will prevent its fracture, as well as the contusion of the gum.

The manner of using the paces is this: the tooth is to be laid hold of, upon the fang, as far as possible under the gum. The instrument is then to be grasped with a force just sufficient to hold the tooth tight, but not to pinch so hard as to crush it. The attachment of the periosteum of the fang to that of the socket is then to be separated by moving the tooth from side to side, by a gentle but steady motion of the wrist. When the tooth has thus been moved in its socket, it may be drawn straight out. Sometimes it will be requisite to use efforts for some time to loosen the tooth; for it must be remarked, that scarcely any man has sufficient strength to extract one of these teeth by direct force; but if a tooth be first loosened in the socket, by moving it from side to side, it may then be extracted suc-

cessfully. The teeth of children are always removed with facility ; the only impediment being the resistance induced by their fears.

The biscuspides and molares should be extracted with the key instrument which must be always furnished with three claws, adapted to the different sizes of the crowns of the teeth. The smallest claw is designed for the biscuspides ; the next in size for the molares of the under jaw, and the dentes sapientiæ of the upper jaw ; and the largest size for the first and second molares of the upper jaw. The biscuspides of the upper jaw may be extracted with the claw placed in the usual mode, as little difficulty attends their removal ; but the biscuspides of the lower jaw being very long and slender, the fangs are liable to be broken off at about two-thirds of their length, leaving a piece in the socket; this circumstance arises from the pressure of the bolster of the instrument against the exterior part of the middle of the fang, and the resistance to the extraction of the fang made by the inner and lower part of the socket.

These accidents are certainly avoided by fixing the claw behind the bolster, as in fig. 8, Plate VII. and in Plate VIII. fig. 2. The instrument, in this way, acts upon the tooth only in the place were the claw is fixed, and, by the fulcrum being applied

beyond the tooth, no resistance is made against the side of the alveolus ; thus the tooth is usually extracted perfectly whole, and with great ease.

The molares are extracted with claws proportioned to their size, which are to be fixed even with the bolster.*

Much diversity of opinion has existed as to the precise direction in which the teeth should be drawn: it has been recommended by some, to draw the second and third molares of the under jaw inwardly, and all the others outwardly. The reason assigned for this rule is, that those teeth naturally incline inwardly, and the alveolar processes, being thin on that side, yield with greater ease, by which the extraction of the tooth is facilitated.

From much experience, however, I have found that this plan cannot be practised without incurring difficulty and danger ; when these teeth incline much inwards, they are situated out of the perpendicular with respect to the jaw, and hang considerably over the base. When the instrument is fixed, the claw taking hold of the tooth at the outer side, the bolster presses upon the jaw in a part relative to the tooth, in a line so much

* Plate VII. fig. 7. and Plate VIII. fig. 3.

out of the perpendicular, that the force applied acts upon the tooth in a diagonal line from the outer part, at the neck, to about the middle of the inner part of the fangs; hence there is great danger, if the fangs are very strong, that the tooth will be broken off, and leave a part of the fangs in the socket. There is also danger lest the extraction of the tooth should be attended with a fracture of the alveolar processes, for it is very liable to extend considerably.*

Much soreness is likewise occasioned by the pressure of the instrument against the soft parts under the side of the tongue, which causes a swelling and a tenderness that continue for some time. Extraction, in this manner, is frequently rendered impracticable, by the caries being situated at the side where the claw should be fixed: this is very commonly the case with the dentes sapientiæ, which would render the removal of these teeth an impossibility, without using the instrument according to Mr. Spence's improvement.† For these reasons, a general rule may be given, that the key instrument should always be applied in such a manner, as to extract the tooth outwardly, except in those cases where the state of the decay renders it impossible.

The extraction of the dentes sapientiæ of the under jaw is

* Plate VIII. fig. 5. † Plate VII. fig. 6.

attended with more difficulty than that of any other of the teeth. The jaw-bone begins to rise on the outer side of the dentes sapientiæ, in order to form the coronoid process; and, in some persons, the rise of the bone is nearly as high as the tooth. Hence there is not sufficient depth for the bolster of the instrument to be applied on the outside of the tooth, and there would always be a necessity for drawing the tooth inwardly, if we did not possess a safe method of extracting it outwardly. It was with this view that the improvement of Mr. Spence was introduced. A dens sapientiæ, which is much decayed on the outer side, could not be drawn inwardly, because the decayed state of the tooth would prevent proper hold for the instrument. Likewise, with a common key instrument, it would not be possible to draw it outwardly, because the rise of the jaw-bone would render it impracticable. These difficulties are entirely obviated by advancing the claw beyond the bolster; a fulcrum is then conveniently obtained by applying the bolster upon the jaw at the outer side of the second molaris, and the claw being fixed on the inner side of the tooth, it may be drawn outwardly with great safety. By operating in this manner, much difficulty is obviated, and the danger of breaking away large portions of the alveolar processes is prevented.*

* Plate VIII. fig. 1.

Stumps are often extracted with much ease ; they are sometimes so much thrust out by the socket as to require very little force for their removal ; but in other instances, there is great difficulty, from the depth at which they are placed in the jaw, and the very decayed state of the exposed part. Stumps can rarely be extracted with the key instrument, as a sufficient purchase for the claw can scarcely be obtained, they must therefore be extracted with the punch. The mode of using this instrument is as follows : the gum should be well separated with the lancet, that the instrument may be applied to a sound part of the stump; it is then to be pushed with a steady force, sufficient to displace the stump from the socket. As there is danger that the punch may slip, and tear some part of the mouth, care should be taken to avoid such an accident, by wrapping a cloth around the forefinger of the left hand, which, being introduced into the mouth, will receive the point of the instrument, should it slip, and prevent any injury from being inflicted.

In extracting a tooth, the first thing to be considered, is the choice of a claw adapted to the size of a tooth: it should neither be too large, nor too small: if it be too large, there is great danger of breaking away a large portion of the alveolar process ; and, if it be too small, as it can only act upon the crown of the

tooth, there will be almost a certainty of breaking it off, and leaving the fangs in the socket.

In Plate VIII. are two examples of the dangerous consequences of attempting to use an instrument with too large a claw, Fig. 7 is the representation of all the molares of the upper jaw that were torn from the mouth of a gentleman, by an injudicious operator, in attempting to extract one of them, which was decayed.

Fig. 8, represents the dens sapientiæ of the lower jaw, of a lady, which was attempted to be extracted inwardly with too large an instrument; the consequence was, the bringing away a large piece of the jaw with the tooth, as described.

The fixing an instrument upon the tooth is a circumstance which ought particularly to be attended to, as many teeth have been broken for want of regarding this circumstance.

The key instrument, in the extraction of a tooth, acts precisely upon the principle of a lever of the first kind. It is an improvement upon the very ancient instrument called the pelican, which consisted of a claw laying hold of the tooth, a fulcrum to press upon the jaw, and a straight handle by which to exert

the power. In the present form of the instrument, the claw, or hook, forms the point of the lever, the bolster the fulcrum, and the handle, which is now placed at a right angle with respect to the claw, is the part with which to exert the power.

The point of the claw should always be fixed as far as possible on the neck of the tooth, that the power may act upon the fangs; and the bolster should be fixed on the opposite side, rather below the point of the claw. When an instrument is thus fixed, and power is applied by turning the handle, it immediately acts, by raising the tooth.* But, if the point of the claw and the fulcrum be in direct opposition to each other, the increasing of the power only pinches the crown of the tooth, and does not act so as to raise the fangs. In this case, the crown of the tooth must be broken off, without moving the fangs, or the claw will be broken in the centre of its curve.†

When the instrument has been fixed in a proper manner, the next thing to be regarded is the best mode of using it.

There is one method of using the instrument which cannot be too strongly reprobated, as it is sometimes attended with the most mischievous consequences; this is, the attempting to extract

* Plate VIII. fig. 4. † Plate VIII. fig. 6.

a tooth quickly, by turning the instrument in a sudden, violent manner. I have known many accidents result from this practice, and therefore cannot but condemn it in the strongest terms. No tooth can be extracted safely, unless its attachment to the jaw be overcome by a force, which being gradually increased, will cause the parts concerned to yield with safety. For want of attending to this principle, various distressing accidents have been occasioned; commonly the teeth are broken in the socket, and sometimes part of the jaw itself; and often the alveolar processes are extensively fractured. About six years ago, I attended a lady who suffered most dreadfully, for a great length of time, from having a tooth extracted in this sudden manner. The gentleman who performed the operation, removed the tooth, the second bicuspis in the lower jaw, with a very sudden jerk of the instrument; two or three days afterwards, the face became much swollen, and a considerable quantity of matter formed; this was discharged at the socket from which the tooth had been drawn. The lady was in this state when I saw her; the discharge of matter was very considerable, and the other bicuspis was somewhat loosened; it was very tender to the touch, and appeared to be a cause of irritation: it was, therefore, judged expedient to remove it. The pain and discharge of matter still continued, and small pieces of bone worked out of the gum; at length the abscess extended to the socket of the first molaris, and it became so tender as to make

it necessary to extract that tooth. Shortly after this had been drawn, some very large pieces of the jaw exfoliated; but still the lady was not relieved from pain, nor did the abscess appear to be disposed to heal: in a little time afterwards, the second molaris became sore, and was affected by the abscess as the other teeth had been; and, therefore, it was determined upon, that this also should be extracted. The removal of this tooth permitted a piece of bone, more than two inches in length, to come away; soon after which the discharge of matter ceased, and the parts became perfectly healed. This is an instance in which three teeth were lost, besides the originally diseased one, with extensive exfoliation of the jaw, and six months excessive pain; all this resulting from extracting a tooth with a violent jerk.

To be able to extract a tooth well, the surgeon should act with firmness and self-possession: having these qualifications, he will not be so confused as to place the instrument upon a wrong tooth, nor act with so much precipitation as to endanger the safety of the patient.

The observation of a most distinguished anatomical lecturer, that all operations are performed sufficiently quick, which are performed well, is very applicable to the extraction of a tooth.

The plan that I have always adopted, with the greatest success, is gradually to increase the power of the instrument until the tooth be moved; and then, by raising the hand, endeavour to draw the tooth in a direction as nearly perpendicular as possible.

Sometimes, although the utmost care has been taken in the extraction of a tooth, a portion of the alveolar process will be broken off: it may either come away adhering to the tooth, or it may remain loose in the socket: it is, therefore, highly proper that the gum should be cautiously examined, and, if any loose splinter be felt, it must be taken away: for this purpose it is always right to be prepared with a pair of forceps. If any splinter should be left in the gum, it will be productive of future inconvenience, as the gum remains very sore, and is kept from healing until the piece of bone has come away. This examination may always be made at the time of closing the gums, without exciting any alarm in the mind of the patient.

When the crown of a tooth is much decayed, success does not always attend an attempt to extract it; the whole, or a part of the fangs may remain: sometimes the gum will grow over such portions of the fangs, and then they can no longer be the cause of uneasiness: or the socket, by closing at the bottom, will gradually thrust them forwards, until they may readily be taken

hold of, and extracted. The pain of the tooth-ache is usually removed by the destruction of part of the nervous membrane, or the hemorrhage caused by the operation; and, if the stumps should afterwards become troublesome, they may, in a few months, be easily removed.

Sometimes, after the extraction of a tooth, a considerable hemorrhage continues; the artery which belonged to the tooth does not contract; or, from being of large size, a coagulum sufficiently strong to restrain the flow of blood is not formed. Hence a great quantity of blood may be lost. The best mode of stopping this hemorrhage is by the application of pressure. A piece of very fine lint, or cotton, dipped in spirits of turpentine, should be pressed into the socket, over which a large compress of lint should be laid, which may either be pressed firmly with the finger, or, in closing the mouth, by the teeth of the other jaw. In this manner, a hemorrhage may soon be restrained; little or no benefit is ever derived from washing the gums with styptic remedies, as they cannot act upon the mouth of the bleeding vessel, and therefore are ineffectual.

OF LUXATION OF THE LOWER JAW.

When I commenced the present work, I had no intention of introducing this subject, as it was then one upon which I had not had any experience; but, having since had an opportunity of attending a case, I think there is a propriety in making some remarks upon this very disagreeable accident. The object I have chiefly in view, is to take notice of a mode of reduction, which, although it has been long recommended, is not sufficiently known; but which is much more expeditious, and less painful to the patient, than the one commonly adopted.

The structure of the articulation of the lower jaw, and the nature of its dislocation, have been treated with great minuteness, by several distinguished anatomists. Dr. Monro's excellent dissertation, first inserted in the Edinburgh Medical Essays, and afterwards published in the complete edition of his works, is not only comprehensive in its anatomical description, but contains the most accurate rules for the reduction.

The condyloid processes of the lower jaw are connected with those parts of the temporal bones which are situated just under the beginning of the zygomatic arch, and before the *meatus auditorius externus.* In this part of each of the temporal bones, there is a cavity adapted for the reception of the condyles, and a tubercle, or eminence, which, with the cavity, forms the articulatory surface.* The condyles of the jaw, and the cavities and eminences of the temporal bones, are covered with a smooth cartilage; there is also interposed between the condyles and the temporal bones a cartilage, which is moveable, and which contributes greatly to the steadiness of the jaw in all its motions. These parts are united by a ligament, which rises from the circumference of the articulatory surface of the temporal bone, is attached to the edge of the moveable cartilage, and then surrounds the condyle of the jaw, and is inserted into the neck of that bone.†

The structure of this joint is admirably adapted to the necessity which exists for a great variety of motions, combined with strength of action; it is peculiar to the human subject; all animals possess the moveable cartilage, as it is of essential service in diminishing the effects of friction. Graminivorous animals, which require an apparatus suited to the grinding and minutely dividing of their food, possess considerable lateral motion of the jaw,

* Plate IX. fig. 4. † Plate IX. fig. 3.

whereby they can move it from side to side, as in chewing the cud; and they reduce their food to an impalpable mass. For this purpose the articulatory surfaces on the temporal bones are very large, and permit the condyles of the jaw to perform the necessary lateral motion. Carnivorous animals, which only tear or cut their food, and require no grinding, have their jaw confined to the simple hinge-formed joint, and therefore possess only the power of depressing and elevating the jaw.

Man, being an inhabitant of every clime, is provided with digestive organs suited to every kind of food; the articulation of his jaw, therefore partakes of the structure both of the graminivorous and carnivorous animal: it can perform lateral motion, and be confined to mere elevation and depression.

When the mouth is closed, the condyles of the jaw are placed back in the cavities; when the jaw is brought horizontally forwards, the condyles slide forward upon the eminences: this action may be performed by the condyles alternately, one being brought forward and the other held back, so that the jaw may be turned from side to side, as in the action of grinding. In opening the mouth, the condyles slide forward upon the eminences; when it is required to open it very wide, the condyles are brought forward to the extremity of the articulatory surface,

and rise a little, by passing over the convexity. In all these motions of the jaw, the moveable cartilage is of very great service: it is doubly concave, and, by adapting itself to the rounded head of the condyle, and that part of the articulatory surface which forms the eminence, it gives steadiness to the jaw in all its motions; without this cartilage, the jaw would have been very liable to accident. As convex surfaces can only touch at one point, the condyles would have been liable to slip back into the cavity, or too much forward and cause a dislocation.

The motion of the lower jaw is produced by five pairs of muscles; these are, the *masseter, temporalis, pterygoidæus externus, pterygoidæus internus,* and *digastricus.* The *masseter, temporalis,* and *pterygoidæus internus,* act in raising the jaw, and in bringing it back. The *pterygoidæi externi* act in bringing the jaw forward; when one only of these muscles acts, a lateral motion is produced, one condyle is brought forward, while the other is kept back; this alternate action of the muscles causes the jaw to be moved from side to side, and produces the action of grinding. The digastric muscles are employed to depress the jaw.

The luxation of the jaw is commonly occasioned by an excessive opening of the mouth; as in yawning, or from a spasmodic action of the muscles affecting them at the time of opening the

mouth. When the jaw is luxated, it remains wide open, and the patient cannot shut it by any muscular exertion. The nature of this accident will be made very plain, by observing that, when the jaw is luxated, the condyles are advanced so much upon the anterior part of the eminence, that they quit the proper place of their articulation; the muscles then cannot draw the jaw back on account of the posterior edges of the condyloid processes being fixed against that part of the eminence where it goes to form the zygomatic process.*

A person, to whom this accident has once happened, is liable to a recurrence, whenever the mouth is opened very widely; a circumstance which renders the caution necessary, of supporting the jaw, in order to prevent too great an extension in yawning, &c. On this account also, those who have been subject to luxation of the jaw are in danger, if under the necessity of submitting to the extraction of a tooth, as at this time the mouth must be opened widely, and the muscles are then liable to be spasmodically affected.

The mode of reduction that has been commonly recommended is, to wrap linen about the two thumbs, which are to be introduced between the posterior molares; the base of the jaw is to

* Plate IX. fig. 2.

be held firmly by the fingers, and the palms of the hands are to be applied to the chin. The extension is made by pressing the jaw down at the posterior part with the thumbs, when also it may be pulled a little forward by the fingers: at this time, if the muscles appear to yield, the chin is to be raised by pressing it upwards with the palms, when the condyles become disengaged from the zygoma, and they slide backward into their proper situation.

Dr. Monro observes, "that when the thumbs have not force enough to make this reduction, his friend Dr. Simpson, professor of medicine at St. Andrew's, makes use of a round piece of wood, eight or nine inches long, one end of which is cut into the form of a wedge, to introduce it between the teeth of the luxated side, with the thinnest part, as far back as the posterior grinders: when, having the head secured, and raising the chin, he pushes the other end of the wood upwards, to depress the back part of the jaw with the thin end, by which the force is much greater than the thumbs can exert."

It was in attempting to extract a tooth that I had an opportunity of attending to this accident. Last summer, in passing through Dorchester, I called to see a gentleman, who, after the customary salutations, informed me there was a lady of his ac-

quaintance who wished to have a tooth extracted, and was at that instant upon the point of going to Weymouth, to consult a dentist from London, who was on a visit there. He immediately introduced me to her. I found that this lady had several times been the subject of luxation of the jaw, and she was in fear lest that accident should again be occasioned by the operation. The tooth she wished to be extracted was one of the dentes sapientiæ of the lower jaw. I consented to attempt the operation, but wished that Mr. Arden, the surgeon, who had reduced her jaw two or three times before, should be present. I had scarcely fixed the instrument upon the tooth, when, by a spasmodic action of the muscles, the jaw slipt forward, and became luxated. Attempts were immediately made, first by Mr. Arden, and then by myself, to reduce the jaw by the usual method of pressing down the back part of the jaw with the thumbs, and raising the chin with the palms of the hands: but neither of us could succeed, although very considerable efforts were made. I then happened to recollect a statement once made to me by M. de Chemant, of his having been frequently applied to by a person at Paris, who was subject to this accident, and that he always succeeded in reducing the luxation immediately, by making use of a lever of wood, as recommended by Dr. Monro. I then inquired for a piece of wood, which I could employ in this way, and was so fortunate as to be furnished with a piece of about an inch square, and ten or

twelve inches long, which was used as a flat ruler. I introduced this into the mouth, so that the extremity lay upon the under molares, and then, by raising the other end with my hand, the teeth in the upper jaw became the fulcrum. The jaw on that side was then depressed at the posterior part, when the condyle immediately passed over the edge of the eminence. I then applied the lever to the other side of the jaw, and disengaged that in like manner, when the muscles instantly drew the jaw back into its proper situation.

The quickness with which the reduction was performed, by this means, gave great pleasure, as the lady had sometimes been a very long time before reduction in the common mode could be effected. Once, when at a distance from home, this accident happened to her, and she was nearly two hours submitting to attempts, before reduction could be effected.

In addition to this case, I have been informed by Mr. Heaviside, that he was lately sent for to reduce a luxation of the jaw, which had occurred to a lady, from merely opening her mouth widely, to have her teeth scaled.

To prevent this accident from happening in the extraction of a tooth, to persons who have previously been subject to a luxa-

tion of the jaw, I have contrived a bandage, which will insure the safety of the patient during the operation. This bandage consists of a piece of leather, formed so as to receive the chin, and a strong cap, that may be placed upon the top of the head, which are connected by two straps on each side: it is to be fixed when the mouth is opened to a certain degree, with the condyles as far back as possible; the cap is then to be put on the posterior part of the crown of the head, and the leather being applied to the chin, the straps are to be buckled tight, when it will not be possible, by any effort, to advance the jaw so much as to endanger its luxation, and the tooth may be extracted with safety.*

* Plate IX. fig. 5.

THE END.

EXPLANATION

OF THE

PLATES.

PLATE I.

Fig. 1, 2, 3, 4, 5, 6. Represent the progress of caries. On the side of Fig. 1, is a dark appearance, resembling an opaque spot upon the enamel: in fig. 2, the caries has produced a cavity: fig. 3 is the section of a molaris, to show that the caries proceeds to the natural cavity in the tooth: fig. 4, a molaris with caries in the centre: fig. 5, the decay much increased: and fig. 6, the whole of the crown being removed, the fangs only are left.

Fig. 3 *a*. The section of a molaris, in which there was a superficial decay; a dark mark is seen extending from the caries to the cavity in the tooth, showing the direction of the death of the bone of the tooth.

Fig. 4 *a*. A molaris apparently quite sound; but, on being sawn into, a considerable caries was formed in the body of the tooth.

Fig. 5 *a*. The enamel of a molaris which separated from the tooth, in consequence of the bony part being destroyed by caries.

Fig. 6 *a*. A stump protruded by the closing of the socket, until it was held only by the gum.

Fig. 7. The incisors of a child decayed, the points of the fangs ulcerated through the gums.

Fig. 8. An exfoliation from the upper jaw, containing two incisors and a cuspidatus: the disease was caused by the inflammation attendant on the decay in the lateral incisor.

Fig. 9. An exfoliation from the under jaw, from the effects of caries in a molaris.

Fig. 10. The effects of an abscess at the point of a stump. A considerable portion of the alveolar process is absorbed.

Fig. 11. The point of a stump with a membranous bag attached to it, in which matter was contained.

Fig. 12. Two molares extracted on account of exostosis of the fangs.

Fig. 13. Examples of exostosis of the fangs in several teeth.

PLATE II.

Fig. 1. Caries on the sides of the incisors.

Fig. 2. Represents the teeth with the caries filed out.

Fig. 3. The appearance of the teeth when denuded of the enamel.

Fig. 4. A deep notch formed at the necks of the teeth by the denuding process.

Fig. 5. Two cuspidati, with deep notches, from the same cause.

Fig. 6. Examples of diseases in the fang, resembling spina ventosa.

Fig. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16. Diseases of the fang, resembling necrosis in bones.

Fig. 17, 17. Two molares, the fangs of which were absorbed in consequence of a tumour formed in the antrum.

Fig. 18. A tooth which had been transplanted, the fang of which was absorbed in a most curious manner.

Fig. 19. Two incisors of the under jaw, the fangs of which were absorbed, in consequence of disease in the socket.

PLATE III.

Fig. 1. A central incisor protruded by the closing of the socket at the extremity of the fang.

Fig. 2. The two lateral incisors protruded from the same cause.

Fig. 3. A great separation of the central incisors from an exostosis of the transverse alveolar process.

Fig. 4. Irregularity of the teeth arising from disease of the sockets.

Fig. 5. The appearance of the teeth under absorption of the gums and alveolar processes.

Fig. 6. Absorption of the gums and sockets, leaving the fangs of the teeth uncovered and black.

Fig. 7. Absorption of the gums and sockets of two teeth in the under jaw.

Fig. 8. The same disease in the gums and sockets of three teeth in the upper jaw.

Fig. 9. Two teeth fractured at the points; the fracture not having extended into the cavities, the dotted lines show how much may be filed off to make them even.

Fig. 10. Two teeth fractured by a blow; the cavities in each were exposed, and caused great inflammation; *a*..... points to the cavities.

Fig. 11. Two central incisors fractured by a blow; the remainder of the crowns were filed off, and the teeth pivoted to the fangs.

PLATE IV.

Fig. 1. Black, hard tartar, collected about the necks of the teeth.

Fig. 2. Represents the yellowish coloured tartar, and the teeth much stained.

Fig. 3. The manner in which the progressive accumulation of tartar causes the loss of teeth.

Fig. 4, 5, 7, 8, 9, 10, 11, 12, 13. Examples of considerable accumulation of tartar about different teeth.

Fig. 6. A piece containing six artificial teeth, about which a most prodigious quantity of tartar was suffered to accumulate, also a large mass about the cuspidatus ; the whole, when quite dry, weighed three drachms and a half.

Fig. 14. A large accumulation on the side of the molares.

Fig. 15. A large quantity collected on the posterior surface of the under incisors.

Fig. 16. A similar accumulation on the anterior surface of the incisors.

PLATE V.

Fig. 1. An exfoliation of the alveolar processes of the temporary teeth, proceeding from a scrofulous disease in the gums.

Fig. 2. An exfoliation of jaw-bone and teeth, in consequence of the exhibition of too much mercury.

Fig. 3. The greater part of the under jaw, which exfoliated in consequence of a violent salivation.

Fig. 4, 5. Exfoliations of nearly the whole of the under jaw, and a piece of the upper jaw, produced by the small-pox.

Fig. 6, 7. Exfoliations from the upper and under jaw, caused by the small-pox.

Fig. 8. An exostosis of the bones of the palate.

PLATE VI.

The scull of a female who had a disease of the antrum, which produced an ossific tumor, in the possession of John Heaviside, Esq.

a. The cartilage of the nose unaffected by the disease.

b b b b b. The extent of the bony tumor.

c. The bony matter that filled up the roof of the mouth.

d d d d d d d. Several teeth pushed out of their proper situations; the sockets of which are greatly absorbed. The dark parts on the surface of the tumor are chasms made by the matter under the integuments.

PLATE VII.

Fig. 1. The appearance of the face of the person who was the subject of the antrum case, described in Plate VI. before any ulceration took place.

Fig. 1. The profile of the face of a young gentleman who had a distorted growth of the upper jaw, combined with hare lip.

Fig. 2. The piece of bone, with three teeth, which was sawn off.

Fig. 3. The appearance of the face after the operation was completed.

Fig. 4. Represents the teeth of a Malay Indian, which are filed on the anterior surface; the central incisors were filed so nearly into the cavities, as to be the cause of caries.

Fig. 5. Represents the teeth of an Abyssinian Negro, filed into a pointed form.

Fig. 6. The key instrument, having three places in which the claw may be fixed: in this figure, the claw is placed beyond the bolster.

Fig. 7. The claw is placed in the usual position.

Fig. 8. The claw is placed before the bolster.

PLATE VIII.

Fig. 1. The key instrument, with the claw beyond the bolster, and fixed as in the extraction of the dens sapientiæ in the lower jaw.

Fig. 2. The key instrument, with the claw before the bolster, and fixed as in the extraction of a bicuspis in the lower jaw.

Fig. 3. The key instrument, with the claw opposite to the bolster, and fixed as in the extraction of the molares.

Fig. 4. The key instrument as fixed in the most proper manner.

Fig. 5. Represents the possible consequence of using too large a claw, or of placing the bolster too low; the tooth is liable to be broken in the direction of the dotted line.

Fig. 6. Represents the possible consequence of using too small a claw; the tooth is liable to be broken in the direction of the dotted line, across the neck of the tooth, or the claw will be broken in the centre of the curve.

Fig. 7. The molares of the upper jaw, which were torn away by an improper mode of attempting to extract one which was decayed.

Fig. 8. A dens sapientiæ, with a large piece of jaw-bone, broken away by an unskilful application of the instrument.

Fig. 9. Represents the manner in which teeth incline towards each other, after an intermediate one has been extracted.

PLATE IX.

Fig. 1. The appearance of the jaw-bones when the whole of the alveolar processes have been absorbed.

Fig. 2. The position of the lower jaw when luxated; the condyloid processes are advanced so much over the articulatory eminence, that it is prevented from returning, by resting against the lower part of the zygomatic arch.

Fig. 3. A section of the temporal bone with the condyloid process of the lower jaw, representing the ligament and moveable cartilage.

Fig. 4. A section of the temporal bone and part of the lower jaw, representing the head of the condyloid process in the cavity; the articulatory eminence, or tubercle, being before the condyle.

Fig. 5. Represents a mouth opened, and a bandage applied to keep the jaw back, and prevent luxation during the extraction of a tooth.

PLATE X.

Represents the case of Sarah Dulwich, vide p. 89.

Fig. 1. The appearance of her face when first admitted into Guy's Hospital.

Fig. 2. The appearance about two months after her admission, when the tumour began to protrude from the mouth, having the surface ulcerated.

Fig. 3, 4. The appearance a short time before her decease, viewed laterally and in front.

*** The unfortunate sufferer was alive when the former account of her case, as before inserted, was in the press, rendering it impossible in the body of the work to detail all the particulars. The following account is taken from the notes of Mr. Astley Cooper, who possesses the preparation of this most extraordinary disease.

Sarah Dulwich, æt. 13, scrofulous constitution, was admitted into Guy's Hospital on April 8, 1812, with a large tumour under the left cheek, which first made its appearance twelve months previously, in the form of a small tumour of the gum upon the lower jaw, and at that time not painful.

At the time of her admission, the tumour occupied the whole of the left cheek; it was globular; it felt irregular under the integuments; it projected below the jaw, and extended from the cuspidatus of the lower jaw on the right side, irregularly under the tongue, which it had thrust close to the right cheek, and consequently rendering speech difficult and indistinct; internally its surface was irregular, hard, and unyielding; it was in a superficial state of ulceration from the pressure of the teeth of the upper jaw on the left side. For six months previously from its rising above the teeth of the lower jaw it prevented the approximation of the jaws, the lips remaining an inch and a half or two inches apart. The discharge from the ulcerated surface was sometimes bloody and offensive to the smell.

Upon viewing the tumour externally it reached from under the edge of the orbit, extending by the side, and pushing up the left nostril, and around to the ear, forming an immense extended tumour even down to the fore part of the chin; it was at least half the size of the head, the skin in some places had a slight blush on it, and here and there the veins were seen of considerable size running over its surface.

Deglutition was extremely difficult and painful in consequence of the pressure of the tumour against the teeth of the upper jaw.

Half the upper jaw, together with the teeth, from the pressure of the tumour, were pushed towards the opposite side.

The only cause she can assign for the disease is, that she was subject to constant tooth-ache in the two molar teeth of the lower jaw, for two or three months previous to the appearance of the tumour on the gum. In other respects her health is good.

The tumour continued increasing in size, and distorting the countenance. About two or three months after admission, it began to press forward and to hang out of the mouth, and about this time she began to be troubled with a constant discharge of saliva over the tumour, together with a profuse discharge of fœtid bloody matter.

About five or six months after her admission the tumour and lower jaw became extremely painful, and small pieces of the jaw began to exfoliate from under the tumour, and from that time to her demise about ten or twelve pieces of bone exfoliated.

She died in about eleven months after admission.

DISSECTION.

The tumour was found to be growing from the inner and left side of the lower jaw.

It had thrust the tongue backwards and to the right side, so that its apex reached only to the cuspidatus tooth.

The upper edge of the lower jaw was thrust forwards, and the teeth, instead of being opposed to those of the upper jaw, had their points thrust forwards and outwards.

One of the molares on the left side was carried by the tumour in which it was embedded to the right side under the apex of the tongue.

On cutting into the disease it was found white in colour, firm, and of a consistence approaching to the nature of cartilage, but not quite so firm; but under this cartilage, and close to the jaw, the basis of the tumour was composed of large masses of bone.

The periosteum of the jaw covered the tumour.

This disease was therefore an exostosis of the lower jaw, but its surface remained cartilaginous whilst its basis was composed of bone.

ASTLEY COOPER.

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